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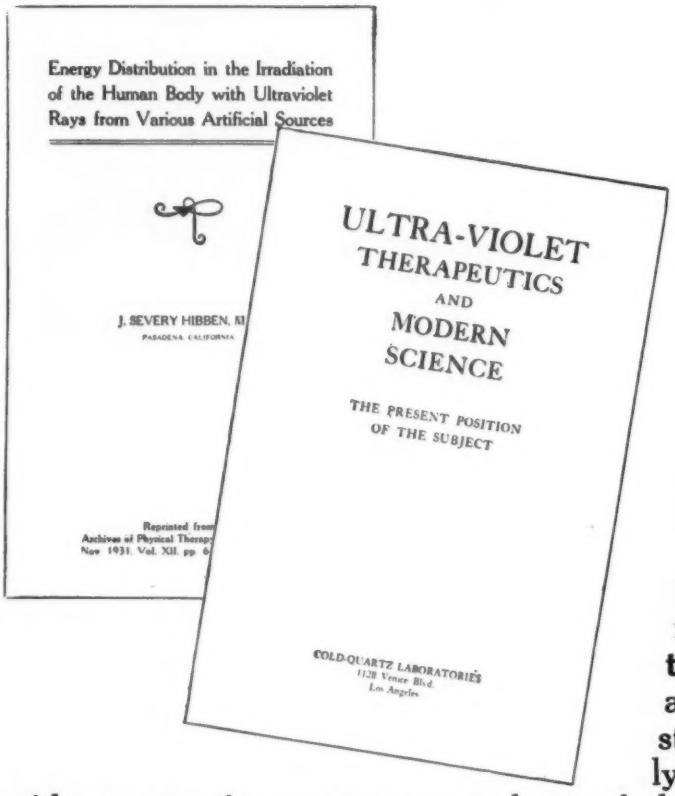
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A P 2-32

# THE TREATMENT OF BRONCHIAL CARCINOMA BY ELECTROCOAGULATION, RADIUM IMPLANTS AND HIGH VOLTAGE X-RAY *

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OMAHA, NEBRASKA

Autopsy statistics point to an increase in the number of bronchial carcinomas during the last decade. At the same time the advances made in diagnosis of lung diseases has resulted in a much higher percentage of ante mortem diagnosis of bronchial carcinoma. The x-ray findings have helped materially in this advance as has the more general use of the bronchoscope. In fact the bronchoscopic examination will reveal the tumor in the bronchus at a much earlier stage than will the x-ray. The tumor can be seen through the bronchoscope when small and before complete obstruction has occurred, while the x-ray findings are rarely positive until secondary changes have occurred in the lung distal to the tumor due to occlusion of the bronchus great enough to produce atelectasis or infection.

Considerable discussion is being carried on as to the possible cause of the increase in the number of primary bronchial carcinomas. Some think the inhalation of fumes from automobile exhausts and gasoline may be a factor. Others advance the theory that the increase in cigarette smoking with the common practice of inhalation has been a factor. Still others think the large numbers of men who inhaled noxious gases during the World War may be a cause, the growth coming on the site of a chronic irritation in the bronchus.

On the other hand, autopsy statistics[1] extending from 1878 to 1921 inclusive show a slow but gradual increase in the percentage of carcinoma of the lung as compared to all carcinomas, ranging from .057 per cent in 1878 (Reinhard) to .9 per cent in 1921 (Barron).

A summation of incidence of primary carcinoma of the lung as given by various authors, cited in "Primary Carcinoma, Incidence," by P. E. Rosahn, *Am. Jour. Med. Sc.*, **179**:803-811, June, '30, is as follows:

TALBE I

Summated from authors who give total autopsies and total number of all lung cancers.

| Year | Total Autopsies | Total Cancers | Percentage of Total Cancers to Total Autopsies |
|---|---|---|---|
| 1910-1919 | 74,753 | 7683 | 10.27 |
| 1920-1928 | 45,387 | 5857 | 12.90 |

Simpson * quotes the following statistics showing the gradual increase in primary lung carcinoma:

TABLE II

| Year | Name | Percentage of Carcinoma of the Lung to Total Carcinomata |
|---|---|---|
| 1878 | Reinhard | 0.057 |
| 1895 | Fuchs | 0.067 |
| 1894 | Passler | 0.083 |
| 1894 | Wolf | 0.223 |
| 1907 | Oerstrom | 0.310 |
| 1916 | Briese | 0.460 |
| 1919-1921 | Barron | 0.900 |

Berblinger of Jena, where the majority of deaths are followed by autopsies found a definite increase in the incidence of carcinoma of the lung.

TABLE III

| Year | Percentage of Carcinoma of Lung to Total Carcinomata |
|---|---|
| 1910-1914 | 2.2 |
| 1920-1924 | 8.3 |

London Hospital Statistics in post mortem study is summarized in Table IV.

Males are affected about the ratio of 3 to 1 female, 71.9 males to 24.8 females, as shown in statistics by Adler.[2] Junghanns[3] gives statistics collected from the Krankenhaus at Chemnitz and Dresden, showing the years 1923 to 1928 inclusive in which 20.15 per cent of all carcinomas were in the bronchi of men and 6.16 per cent in the bronchi of women. Car-

* Read at the Tenth Annual Meeting of the American Congress of Physical Therapy, Omaha, Nebraska, October 6th, 1931.

* Primary Carcinoma of the Lung, S. L. Simpson, *Quart. J. Med.*, **22**:413-449, (April), 1929.

TABLE IV

| Year | A—Autopsies | B—Carcinoma of Lung | Percentage B/A |
|---|---|---|---|
| 1907 | 1182 | 6 | 0.51 |
| 1908 | 1259 | 10 | 0.78 |
| 1909 | 1288 | 8 | 0.62 |
| 1910 | 1208 | 7 | 0.58 |
| 1911 | 1265 | 5 | 0.40 |
| 1912 | 905 | 8 | 0.88 |
| 1913 | 878 | 8 | 9.61 |
| 1914 | 784 | 5 | 0.64 |
| 1915 | 719 | 5 | 0.69 |
| 1916 | 653 | 4 | 0.61 |
| 1917 | 581 | 3 | 0.52 |
| 1918 | 615 | 4 | 0.65 |
| 1919 | 645 | 6 | 0.93 |
| 1920 | 750 | 8 | 1.09 |
| 1921 | 598 | 9 | 1.50 |
| 1922 | 589 | 10 | 1.70 |
| 1923 | 604 | 11 | 1.82 |
| 1924 | 578 | 10 | 1.73 |
| 1925 | 585 | 12 | 2.05 |

cinomas of the bronchi occur as a rule, more frequently after the close of the third decade of life, being most frequent in the sixth decade.[4]

## Pathology

Primary carcinoma of the bronchi may arise from the bronchial mucosa, the alveolar epithelium or the bronchial mucous glands. Thirty-two per cent of them are squamous cell carcinomas. Those arising from the mucous glands are usually adenocarcinomas. Others are of the columnar cell type.

Grossly, these growths may be flat, elevated, pedunculated, or ulcerated in character. Forty per cent[4] are found in the right side, 47 per cent in the left side, while nine per cent are found at the bifurcation, and in four per cent the location could not be determined.

## Symptoms

Cough is present in 100 per cent of cases[4] of bronchial carcinoma, expectoration in 89 per cent, pain in the chest in 81 per cent, dyspnea in 62 per cent, and hemoptysis in 58 per cent.

The cough is nonproductive for a considerable period, later becoming productive. It may be constant in character or periodic, and ascribed by the patient as due to attacks of bronchitis. In some cases there may be a wheeze due to partial obstruction of the bronchus.

The expectoration varies from a mucoid to blood tinged or bloody character. Where infection has occurred distal to the tumor, the expectoration will be mucopurulent or purulent in character. Large hemorrhages are rare and when present are due to ulceration of the growth into a good-sized artery.

Pain ranks next in frequency. It may be present in the part of the chest occupied by the carcinoma, or when in the bronchus of an upper lobe may be referred down the arm as mentioned by Pancoast.[5] In one case observed by me, the patient had been treated for several weeks for what had been called neuritis. The tumor arose from the left lobe major bronchus and the pain down the left arm simulated a neuritis involving the ulnar nerve and its brachial trunks. At the time the patient came to me the infiltration of the left upper lobe was clearly demonstrable on x-ray examination.

Dyspnea is a frequent symptom but not constant in all cases. In one patient seen recently, the dyspnea was the leading symptom, so marked that on several occasions artificial respiration was used. The x-ray examination showed complete atelectatic collapse of one lobe during these attacks. At one time the right middle lobe would collapse and at another time the right lower lobe. Bronchoscopic examination showed the tumor located at the bifurcation of the right middle and lower lobe bronchi, acting as a ball valve, sometimes in one bronchus, sometimes in the other.

As the tumor progresses there is usually progressive loss of weight and increasing weakness.

## Physical Findings

The history of a non-productive cough should arouse one's suspicions of bronchial new growth. If the clinician is alert to this symptom and takes precaution to rule out new growth, he will discover the growth at an earlier stage than otherwise. Like cancers in other parts of the body, the earlier bronchial carcinoma is discovered the more hopeful the outlook.

If the patient does not come for examination until later, the changing auscultatory and percussion findings are significant. At one observation dullness or flatness and rales will be clearly demonstrable, and on the next observation may have shifted their position. The patient cited in the paragraph above was a most striking illustration of the variation in physical findings.

In the usual case the x-ray examination will reveal an area of increased density, most dense around the bronchus adjacent to the site of the tumor and gradually fading to a thin irregular margin at some distance out, in

the lobe aerated by the involved bronchus. In patients suffering from infection distal to the tumor, the x-ray may reveal a lobe of evenly increased density resembling a lobar pneumonia or a localized lung abscess. In others a pleural effusion may be present. In patients suffering from infection distal to the carcinoma, the physical findings of the infection may completely overshadow those of the carcinoma so that the correct diagnosis may not be made until after the infection has cleared up.

In one case seen by me, the patient had a lobar pneumonia which failed to clear up. Later rise of temperature and purulent sputum led to the diagnosis of lung abscess. At this stage bronchoscopic examination was made revealing an occluded right lower lobe major bronchus. Passing the tube beyond this point free purulent drainage was established after which clearer vision was possible and the tumor recognized.

This case, illustrates the value to be obtained by bronchoscopic examination. In the early cases it is the only positive method, while in the late cases it has great diagnostic value. The gross appearance of the tumor and, as a rule, the exact location can be determined. At the same time a bit of tissue can be obtained for biopsy.

### Diagnosis

In two cases reported by W. O. Moser[6] positive diagnosis was made by finding cancer tissue in the fluid aspirated from the pleural cavity while another was proven by exploratory operation and biopsy.

Perry[7] calls attention to an important diagnostic point when he says: "A case should never be sent to the x-ray laboratory without first removing a pleural effusion because the latter entirely masks the x-ray picture." I would modify this procedure by making two x-ray examinations, one before and one after aspiration. The comparison of the findings on the two occasions I have found very valuable.

The x-ray findings are valuable to determine whether metastases have occurred. Letulle and Jaqueline[8] call attention to the case of a woman, 36 years of age, who had the primary bronchial carcinoma in one lung and cells from this tumor had been aspirated into the bronchi of the opposite lung where they had continued to grow making new tumors by air borne metastases.

Adler[4] calls attention to the fact that the liver is invaded in 28.5 per cent, the adrenal in 10 per cent and the voluntary muscle in 2 per cent. Ewing[9] states that primary bronchial tumors metastasize to bone in 15 per cent.

### Differential Diagnosis and Complications

Primary bronchial carcinoma must be differentiated from tuberculosis, pneumonia, abscess, syphilis and metastatic new growth from other parts of the body. This differentiation can be made by the nonproductive cough, absence of tubercle bacilli in the sputum, shifting physical findings, x-ray findings and bronchoscopic findings as mentioned above.

Primary bronchial carcinoma may be complicated by pneumonia, abscess, pleural effusion, atelectasis, or metastasis.

### Treatment

High voltage x-ray has been the method of choice in the treatment of primary bronchial carcinoma and has yielded good results. It is especially needed when there is infiltration into the surrounding lung tissue. In my experience, however, it has been impossible to entirely eradicate the primary tumor by high voltage x-ray alone. Bronchoscopic observation revealed reduction in the size of the primary tumor but there was still a small area definitely active.

In view of these bronchoscopic findings, it occurred to me that the remaining portion of the primary growth might be killed by inserting radium element needles in the tumor through the bronchoscope as first mentioned by Yankauer[10] or by inserting radon seeds into the tumor as employed by Greene.[11] I used the radium element needles which resulted in the disappearance of the primary tumor. The discomport to the patient of leaving the needles in place several hours led me to seek additional help from electrocoagulation. A stiff piece of piano wire long enough to work easily through the bronchoscope was insulated with repeated dippings in shellac leaving the point exposed about two millimeters and the proximal end exposed enough to insert into the insulated handle. By use of this electrode the primary tumor was coagulated while the bronchoscope was in place for the diagnostic observation. Actual destruction was observed at once and no bleeding occurred. After three weeks, bronchoscopic observation was repeated showing complete healing by a smooth glos-

Fig. 1. Primary carcinoma right lower lobe major bronchus with infiltration into parenchyma.

Fig. 2. Same patient as Fig. 1, one year later, after high voltage x-ray therapy.

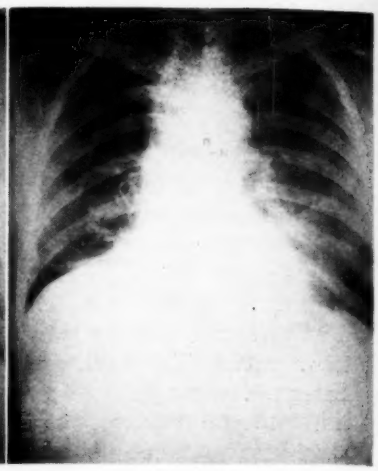

Fig. 3. Same patient as Fig. 1, two and one-half years later after coagulation of residual tumor through bronchoscope.

sy scar. The first patient treated by this method is still well four years after coming under my observation. The same procedure has been used several times since with equally good clinical results.

## Conclusions

It would seem that the best results in the treatment of primary bronchial carcinoma can be obtained by a combination of electrocoagulation and radium implantation into the primary tumor accompanied by high voltage x-ray through the affected area covering the entire affected lobe and corresponding lymphatic areas.

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## Discussions

**Dr. Aaron Arkin** (Chicago, Ill.): About 95 per cent of the carcinomas primary in the lung are bronchogenic in origin. They originate, not in the alveoli which contain no epithelial cells, but in the epithelium of the bronchi themselves. As a result of chronic irritation produced by irritant gases, various dusts, influenza and other respiratory infections, chronic suppurations as in bronchiectases and bronchitis, there occurs a protoplasia of the basal cells which lie below the ciliated columnar epithelium. This then leads to bronchus carcinoma formation. Thus we understand the microscopic findings which show squamous celled, basal celled, and round celled types of carcinoma.

In the earliest stage of protoplasia there may be no symptoms whatever. In some cases the tumor may project into the lumen of a bronchus and lead to atelectasis of the lung, or temporary emphysema when the obstruction is valve-like.

The symptoms of bronchus carcinoma in the stages at which we see the patients, are very variable, and depend largely upon the clinical type of the case. I have, therefore, in the Medical Clinics of North America for April, 1930, divided bronchus carcinoma into the following clinical types (1) endobronchial, (2) hilar, (3) mediastinal, (4) central, (5) lobar, (6) pleural,

Fig. 4. Primary carcinoma at bifurcation of right middle and lower lobe bronchi showing atelectasis of middle and lower lobes. (Courtesy Dr. Homer Davis.)

Fig. 5. Same patient as Fig. 4, showing atelectasis of right lower lobe. (Courtesy Dr. Homer Davis.)

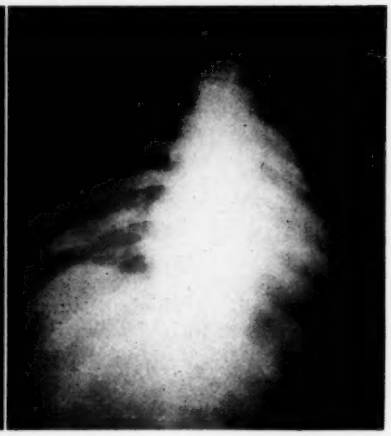

Fig. 6. Same patient as Fig. 4, showing re-expansion of both lobes. (Courtesy Dr. Homer Davis.)

(7) lymphangitis carcinomatosa, and (8) rheumatoid.

Of the general symptoms the most frequent are:

(1) Cough of a persistent nature.

(2) Blood tinged sputum, containing no tubercle bacilli.

(3) Asthmatoid wheeze.

(4) Dyspnoea, and cyanosis.

(5) Pain in the chest, or arms, or elsewhere when there are metastases.

Less common symptoms are clubbed fingers, anisochoria, paralysis of the diaphragm, hoarseness, fever especially when associated with abscess, bronchiectases or empyema, cerebral symptom due to brain metastases, etc.

The physical findings vary in the different types. In the lobar type a characteristic flatness of one lobe, which extends over the area of the sternum, with suppressed breath sounds is most important. Enlarged axillary and supraclavicular glands are often found.

With the aid of the roentgenologist and the bronchoscopist the clinicians should make the correct diagnosis in at least 90 per cent of the cases. Often aspiration of an effusion followed by artificial pneumothorax, a biopsy of an enlarged gland, microscopic examination of an exudate, the presence of bone, liver, lung, brain or other metastases will help to make the correct diagnosis. Repeated x-ray examinations of the chest are often indispensable in determining the nature of the pulmonary condition.

Bronchus carcinoma has increased in frequency in the past 10 years, with the increase in all forms of carcinoma. This, I believe, is due to the increased average of human life, now 57 years, better diagnosis, and especially to more frequent autopsy of cases which were previously buried without determining the exact cause of death. In the Cook County Hospital, where I have contributed in the past three years toward interesting the internes in bronchus carcinoma and its diagnosis, this form of malignant tumor ranks second only to carcinoma of the stomach. We have diagnosed clinically over 90 per cent of our cases in the past three years.

We welcome any aid in the treatment of these unfortunate patients, practically all of whom are doomed to die. Here the bronchoscopist and radiologist may render valuable service in relieving the severe symptoms, and perhaps in effecting a cure in an occasional early accessible case. The view that bronchus carcinoma causes death in a few months is incorrect. I have followed several cases for three to six years. The onset is often very insidious.

**Dr. F. W. Nelson** (Ottumwa, Iowa): What effect has coagulation in comparison to his former x-ray or radium? Had the patient had no x-ray or radium, would you get the same effect from your coagulation?

**Dr. Albert Bachem (Chicago, Illinois):** I am much interested in the deep x-ray treatment as mentioned by Dr. Tyler and I should like to ask whether Dr. Tyler treats the involved area locally as far as indicated by the diagnostic pictures or whether he treats large areas. I couldn't see from the films how much fibrosis is produced and how much importance Dr. Tyler would give to this. I wonder how large a dosage Dr. Tyler gives and which way he applies it, whether massive or in fractional treatments.

**Dr. G. D. Kettlecamp** (St. Louis, Mo.): I should like to ask Dr. Tyler whether, in his experience, he has met with carcinoma more frequently in tuberculous patients than in non-tuberculous patients?

**Dr. A. F. Tyler** (Omaha, Nebr.), closing discussion: In answering Dr. Nelson's question, I should say that the reason I first used coagulation was because I still could see some of the primary tumor remaining in the bronchus after I had used

the x-ray. At present I do the coagulation first, and then follow immediately with the deep x-ray treatment in these cases, especially where it is already infiltrated out into the surrounding lung.

I think if one had the radium seeds that would be preferable to the radium element needles. I had the needles so I used those, but you have to take those out because it causes a good deal of discomfort to the patient. If you use the radium seeds it would be still better.

Answering Dr. Bachem's question, I always try, in all types of carcinoma, including lung carcinoma and bronchial carcinoma, to treat not only what appears to be involved that we can actually demonstrate, but go well beyond that. I usually cover an area of several inches on all sides.

I think in these malignancies of the lung we have to disregard the fibrosis which results from the x-ray treatment. We are trying to save the life of the patient, and I know from experience that a patient can live with a whole lung fibrosed, because I have seen that happen, and he can't live with a carcinoma in the lung. So I would be bold and just forget about the fibrosis in the lung when I knew I was dealing with carcinoma of the bronchus.

As to whether my dosage is given in massive methods, I should say that it probably would be something between the massive and the purely fractional doses. That is, I prefer to give a measured dose in several days' treatment so as to prolong the effect, if possible, during mitosis of all of the different cells in the tumor, and I think we get better effect clinically on the tumor and less disturbance of the patient by doing that.

Then I would repeat that dosage in about six to eight weeks, given in the same manner and continue along as I felt was indicated.

The dosage which I prefer to use is by measuring the dosage, following the modified Dessauer charts as devised by Dr. Bachem, and giving, if possible, pretty close to 100 per cent depth dose in the tumor, going from in front and behind and, if necessary, from lateral areas so as to protect the skin and at the same time build up the dosage in the tumor to the percentage which I think is necessary to destroy it.

I did not hear the name of the doctor from St. Louis; but answering his question, have I met with carcinoma more frequently in tuberculous patients than in non-tuberculous patients, personally, the non-tuberculous have been more frequently observed.

## Tuberculosis Germs Detected in Blood Stream by New Test

A new method by which the presence of tuberculosis germs can be detected in the circulating blood of patients suffering from tuberculosis has been disclosed. The method, developed by Prof. Ernest Loewenstein of Vienna, was described by Dr. Laszlo Detre, of the University of Budapest, Hungary, in a report to the District of Columbia Medical Society.

By this method, Dr. Detre said, the presence of the germ can be detected in very early stages of pulmonary tuberculosis, which is important from the standpoint of successful treatment; in cases of surgical tuberculosis in which there is no fever; and in different forms of tuberculosis of the skin.

"It has proved," said Dr. Detre, "that contrary to older opinions, in an organism attacked by tuberculosis there is a regular circulation of tubercle bacilli in the blood stream."

By means of the new method, it is claimed, certain other diseases have been found to have a tuberculous origin, for instance, acute polyarthritis or acute inflammation of the joints, popularly known as rheumatism. Until now, certain infections of teeth or tonsils have been considered responsible for this disease, Dr. Detre pointed out. But by means of the new test, a tuberculous origin of the disease was found. In most of these arthritic cases it was the bovine form of the tuberculosis germ, that is, the form found in cattle, which played the important role, Dr. Detre stated. Another disease which the new test is said to show has a tuberculous origin is multiple sclerosis, a nervous disease whose cause is generally considered unknown.

Dr. Detre emphasized the practical consequences of the new findings and advised American bacteriologists to follow this new line of research. New methods of treatment are suggested as a result of this new test, he said. Dr. Loewenstein, who has been working for 15 years on this test, which involved the development of a new synthetic culture medium for the germs to grow on, is receiving samples of blood from cities all over Europe for examinatin by the new method.—*Science News Letter,* January 30, 1932.

# ENVIRONMENT, HABITS AND HEALTH *

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"Heaven and earth, center and circumference, were made in the same instance of time, and clouds full of water and Man was created by the Trinity on the 26th of October, 4004 B. C., at 9 A. M." This is the final result arrived at by Dr. John Lightfoot, biblical scholar, Vice-Chancelor of the Cambridge University, in the year 1654.

I am not so sure whether everybody in this meeting will accept this statement; because modern science has come to very different conclusions.

## Evolution of Life

The joint research work of astronomers, geologists and physicists leads to the suggestion that the earth, probably together with the other planets, became separated from the sun about two and one-half to five thousand million years ago.

There was no chance for the existence of any life of any kind, until the surface of the planet cooled off and most of the water of the atmosphere condensed and filled the ocean. Life must have originated in water, as a primitive, submicroscopic substance, out of organic compounds, that were synthesized in an atmosphere of very high pressure, saturated with water vapor, carbondioxide, hydrocarbons, etc., and activated by strong electric discharges and perhaps the first solar irradiation. Whether any living substance of this type is still in existence, in the water of the ocean, or — as a virus or a trephone — in the body fluids, would be an interesting speculation.

When life became cellular and of microscopic size, it found itself confronted with environmental difficulties, namely, the gradually increasing and even qualitatively changing salt content of the ocean water. Macallum has followed up this problem geologically and biologically and arrived at the most fascinating results. One of his conclusions is, that the nucleus of the cell developed as a "sanctuary" for the preservation of the most delicate parts and functions of life, protected by the cytoplasm against the changing chemistry of the environment. When higher organized, multicellular animals finally ascended to the dry land, they preserved the approximate mineral concentration and ratio of the tissue fluids by the stabilizing effect of excretory organs (kidney) and by the protecting effect of the skin (horn, chitin).

The conquest of the land exposed the animals also to extreme changes of temperature. The higher types of animals, mammals and birds, responded to this difficulty by developing a mechanism, designed to stabilize the body temperature. The standard temperature had to be chosen higher than the average temperature of the environment, because it was simpler to produce heat by chemical actions, particularly oxidation, than to dispose of heat by convection, excretion and perspiration. The higher temperature presented the advantage, too, of permitting acceleration of chemical reactions and the physiological and psychological manifestations of life. The establishment of constant temperature is of a relatively recent age, as compared with the fundamental properties of life, and we cannot feel surprise to occasionally see birds and mammals succumb to the extremes of heat and cold.

## Creation of Man

The creation of "man" started with the upright gait. This emancipation from the animal behavior was prepared by the habit of brachiating, typical of monkeys and apes. But the final step was done by our forefathers when descending from the trees into the open spaces of the tundra. In the upright posture the head is better supported. This fact enabled man to increase the size and weight of the brain and to develop it as an organ of intellect. The upper extremities, released from the old function of locomotion, could be developed as delicate and effective implements. But man had to pay a heavy compensation for this progress: The relative position and the shape of the internal organs had to be

* Read at the Tenth Annual Meeting of the American Congress of Physical Therapy, Omaha, Nebraska, October 8th, 1931.

changed; many organs were not properly supported in the new position; they sagged down and pressed on the lower parts. The pylorus and the colon were forced into sharp flexures; the blood pressure and circulation became unequal in the upper and lower parts of the body, and a greater effort of the heart and the vessels was required to overcome these differences; the skeleton underwent pronounced changes in order to adapt itself to the changed distribution of weight, particularly reinforcing the sacrum, the pelvic bones and the lumbar spine. This development, together with the enlargement of the fetal head, increased the difficulties of human childbirth.

A slow process of natural selection set in; it eliminated those who could not adapt themselves to the conditions, brought about by the new habit; those able to comply with the new requirements, however survived and transferred a favorable inheritance to their offspring. This evolution is not finished even at the present time; and many diseases and inconveniences find their explanation on the basis of this process. Intestinal ulcers and cancer occur particularly at those predilection sites as the rectum, sigmoid, splenic and hepatic flexure, pyloric flexure and inner curvature, irritation probably being the exciting (besides the constitutional) cause of this occurrence. Prolapse of the uterus and abdominal hernia may be favored by the changed position of abdominal organs and the increased pressure from above. Flatfoot develops, if the muscles and tendons of the two feet are not strong enough to carry and to balance the whole weight (sometimes excessive) of the body. Varicose veins occur, if the tonus of the vessels is not strong enough to check the increased blood pressure in the lower extremities. Man becomes fatigued more easily by standing and walking than the quadruped; and a stick or cane may serve him as support. Perhaps the cane can be considered as a reminiscence of the gradual erection of man.

The human race developed during a geologically revolutionary period, in which pronounced climatic changes occurred. The mental faculties of man allowed him to withstand the hardships of climate by building tents and huts, and by covering his body with fur or by woven cloths. The invention of glass (although of a more recent date) is to be mentioned in this connection, because it completed the protection against rain, cold and storm. All these measures, though first of a purely protective value, in the course of time led to an artificial change of the natural environment of man. A continuous scale leads from the first straw apron to the modern apparel of man; and from the most primitive hut to the modern apartment house. Biologically and physically this development means nothing else than the retreat from light into darkness, and out of the ventilated atmosphere into stagnant air. And finally, prejudices of fashion and custom have fixed the results of this development and so established its irreversibility.

Yet, at present, we are conscious of the fact, that we are committing a crime against nature, by excluding practically all the stimuli the skin is supposed to receive from its natural environment, and that we are punished for this transgression.

### Protective Mechanisms of the Body

According to the conception of E. Hoffmann, the skin must be considered as an organ with exophylactic and esophylactic power. Exophylaxy is the direct protection against damage from the outside. Light — particularly ultraviolet — increases this exophylactic power by thickening the horny layer, by stimulating the growth of the malpighian layers and by depositing melanin throughout the epidermis, thus hardening the skin against further irradiation and mechanical injury. Light also increases the acidity and the immunizing power of the skin to bacterial and mycotic invasion. It lowers the susceptibility of the skin to tumor implantation, syphilitic infection and smallpox vaccination. Light increases the blood and lymph circulation in the skin and thus strengthens the second line of defense against infection.

A consideration of the effect of light upon the esophylactic power of the skin shows the following facts: First, light increases internal secretion. It produces viosterols which control the calcium and phosphorus assimilation and protect against rickets, tetany, osteomalacia. It stimulates the malpighian layers in the production of enzymes, such as the dopa oxidase, katalase, lipase, diastase. It liberates tyrosin into the bloodstream, which represents an integral part of Jena's Detoxin. It is also

credited with increasing the antibodies in the skin.

Finally, light acts upon the autonomic nervous system either directly, or indirectly by the production of hormones. Irradiation has a particularly vagotonic effect; it causes a lowering of the blood sugar, an increase in phosphorus, calcium and potassium, associated with an increased alkalinity; it causes an increase of the leucocytes in the skin and the splanchnic area, and it increases the respiration volume by deeper and slower respiration. These changes may have a beneficial effect in the prevention of diseases that have to do with a faulty metabolism and with an abnormal status of the vegetative system. We know for instance that tuberculosis is connected with a sympathicotonus, and the effect of light may be particularly due to the antagonistic effect on the parasympathicus.

By discarding all these benefits of irradiation we condemn our body to a number of deficiency diseases. The lack of ultraviolet, unless replaced by a high vitamin D diet, leads to rickets, tetany, osteomalacia. The worst symptoms of rickets are the pelvic deformation (in regard to childbirth); faulty development of the teeth, particularly of the permanent set, such as enamel hypoplasia, incomplete calcification of the dentin, malocclusion, all of these factors predisposing to caries; hyper-irritability of the nervous system; vasoneurotic diathesis, which may represent a constitutional etiological factor for the occurrence of ulcers. Rickets is usually accompanied by a lymphatic hypertrophy (lymph nodes, tonsils, adenoids, spleen), anemia, hypertrophy of the heart; and finally it predisposes strongly to infections, particularly pneumonia.

Whether this disposition is a sequel of rickets or a parallel occurrence, due directly to the lack of light, is still open to discussion. Light starvation favors certain skin diseases, either directly from the lack of stimulation, or indirectly by the breakdown of the vegetative nervous system and the absence of its co-ordinative action on the various powers of the body; psoriasis, eczemas, acne and lupus are to be mentioned in this connection.

### Influence of Skin and Mucous Membrane

One important function of the skin is heat regulation. The difficult part of this function lies in the fact that the heat must be preserved as much as possible in a cool environment, and strongly disposed of in a warm atmosphere. A complicated mechanism serves this purpose. Various stimuli from the skin, and the stimulus from the heat center of the brain, affect the internal secretion, the blood chemistry, the blood capillaries of the skin and the sweatglands, to adapt themselves to the environmental factors. The operation of this mechanism represents a healthful physiological and psychological exercise for the body. It compels the body to do chemical and physical work, and, even more, it requires a co-ordination of the efforts of the whole autonomic apparatus, which includes the nervous system, the endocrines and the bloodvascular system. The beneficial effect of the seaclimate on catarrhal diseases, chronic constipation, nervous exhaustion, insomnia, malnutrition, etc., is mostly due to this stimulating effect of wind, water and light on the autonomic system. The perfect working of this whole mechanism determines to a large extent what one may call a healthy constitution.

Our habits of living in closed rooms and of dressing in heavy and tightly fitting garments, puts this mechanism out of work, and permits its various branches to degenerate, with the result that we are unable to withstand even moderate variations of temperature, usually reacting with a cold to the slightest exposure. Fear of exposure and fashion slavery have finally led the stronger sex to overdress so much, that we are practically living all the time, winter and summer, in a tropical climate, with a temperature of about 85 degrees to 100 degrees F., a humidity of 70 to 100 per cent, not even cooled by any breeze. The cooling mechanism ceases to work under the most extreme conditions, and prostrations and fatalities occur. Even the greatest extremes of heat and humidity could be endured outdoors with loose, light, and transparent suits, and indoors with part of the body exposed to an air current from a fan. It is really surprising to see how much science has taught us and yet how little we are doing practically to make use of it in spite of suffering by our obstinacy.

I may just mention here that the condition of the mucous membranes in the nose and mouth is strongly influenced by the temperature and perspiration of the skin, and as soon as the normal evaporation and the normal blood and lymph circulation is interfered

with, the susceptibility to infections is increased.

### Effect of Modern Clothing

Our clothing has a pronounced effect upon the hydrogen ion concentration of the surface and the various layers of the skin. Marchionini has shown that a mild perspiration furnishes acid sweat as well from the ekkrinal as from the apokrinal glands. The evaporation of the sweat increases the acidity and hydrogen ion concentration, and figures as low as 3 or 2.8 have been measured. Our clothing prevents the evaporation and its cooling effect and causes excessive sweating, which yields less acid or even, from the apokrinal glands, alkaline sweat. Such a moist skin, lacking proper acidity, not exposed to light, leads to bacterial and mycotic invasion, as we observe particularly at predilection sites such as the axillae, the interdigital parts of the feet, and the plantar region.

Summing up, I wish to point out that errors in our mode of clothing are interfering with the normal temperature and the hydrogen ion concentration of the skin and cause abnormal conditions which result in inconveniences and diseases.

It seems to me that fashion and science have reached the point where a break will occur, unless fashion gives way to the dictates of science. It should not be difficult to design a garment, without a narrow collar and a tight belt, so that air ventilation is permitted. And disposing of vest and coat should not carry the stigma of social misdemeanor, but should be permitted as a means to allow the body to cool off, to admit some light and to increase the vitality of body and mind. As long as our mode of dressing is not improved, I see no advantage in windows transparent to ultraviolet, or ultraviolet lamps in factories. I claim that, even in the present day bathing suit, we do not get enough benefit from light and air. The bathing suit, particularly if heavily impregnated with water, is uncomfortable; it interferes with the right posture; and it prevents the body from being exposed uniformly and to react correspondingly.

In the progressive northern countries of Europe (except England), steps have been taken to reduce the bathing suit to a minimum or abolish it altogether. Large estates have been bought and developed for nude air-bathing, and on public beaches and in the wide open spaces greatest freedom is granted to fresh air "fans." England, however, still prefers the doubtful glory of having a typical English disease, to giving up a prudish prejudice in the face of scientifically established facts. It is obvious that America follows the English example. Every day one reads about the arrest of boys who were trapped by the police while taking a sunbath in nature's garb at some secluded spot; or of a woman who let down a shoulder strap in order to get a more uniform tan on the shoulder or back. I am reminded of bootleg sunlight, when I see men exposing their chest behind a baby buggy or an umbrella, in order to be safe from raiders and snoopers. In the north shore suburbs of Chicago prudishness goes so far that one might be in darkest Tennessee. At Evanston (a suburb of Chicago) parking near the beach was limited to fifteen minutes last summer; policemen were detached for close inspection of bathing women. At Wilmette (a contiguous village to Evanston), one is prohibited from walking from the street to the beach in a bathing suit, and one is prohibited from undressing or depositing any apparel on the beach. Well, how is one supposed to take a bath without being arrested? In Kenilworth, (which is geographically north of Wilmette) I got trapped myself and arrested while undressing in a very secluded spot, and was kept for a whole morning in the city hall of Wilmette, because I wanted to see what happened when I refused to pay. It is only this fanaticism that I am attacking. What I want is a reasonable attitude of the government toward a decent population that is enjoying life and following the suggestions of health departments and other medical advice. I do not want to ask for anything that a prudish community cannot stand for.

### The Dangers of Modern Diet

Leaving this subject of overproduction against light and air, we have to deal with another habit, by which man distinguishes himself from the other animals:

Civilized man is accustomed to prepare the food by use of heat, as in cooking, baking and frying.

This habit has one great advantage; the water and the food become sterilized, by the killing of bacteria and parasites, thus reducing the chances of intestinal diseases and epidemics.

Another advantage of cooking lies in the fact, that it makes many foodstuffs more edible and digestible. This holds true particularly for meat, grains and potatoes. Cooking, too, makes them more palatable, particularly if liberal use is made of condiments and sugar. These facts are important from an economic standpoint and also from the guzzlers' point of view. But on the other hand they represent grave dangers for the nutrition of man.

The palatability and softness of the cooked food induce man to eat much more than is needed for the maintenance of the weight of the body and the performance of its functions. This holds particularly true for the great number of people who live an entirely sedentary life. Overeating leads to overweight and is progressive with advancing age. Statistics prove that a small overweight under 35 years of age is of no consequence to the individual's state of health. After 35 years, however, it becomes a physical handicap and a menace to health, and is thereafter associated with an abnormally high death rate, which even increases with advancing age. The disproportion of nourishment and exercise is known as the deciding cause of diabetes; it may also have a relationship to the disposition to cancer. Statistics show that both diseases occur more frequently in periods of prosperity than in times of depression and of war. The overfeeding, particularly with starches and sugar, predisposes strongly to eczema, boils, acne, and is responsible partly for the development of chronic arthritis.

The softness of the cooked food has some other untoward effects which should not be underestimated. It needs very little chewing to masticate the food, and hence a healthy massage to the teeth and gums is thus prevented. The consistency of the food is such, that, instead of cleaning the teeth better than any brushing would do, it sediments between the teeth and readily undergoes bacterial decomposition. Without proper chewing a deposit forms on the teeth, which prevents the cleaning of the teeth by normal saliva and by brushing. This occurrence is suspected as the final cause of caries. Thus it seems that calcium deficiency during embryonic and early life predisposes, and that the diet of adult life actually leads to caries. Caries of the teeth is the main cause of dead pulps and apical abscesses, and these represent the greatest source of focal infections.

The cooked food, lacking the roughage of the more natural foodstuffs, fails also to stimulate the peristalsis of the intestinal track, thus causing intestinal stasis, with the symptom of constipation with its potential harm.

Finally a diet consisting mainly of cooked food shows a deficiency of minerals and vitamins. Sherman has conclusively proved that the most deficient mineral in the American and European diet is calcium.

### Effect on the Mineral Content of the Blood

While such a deficiency in the diet is grave enough by itself, in case of calcium it is further aggravated by the lack of vitamin D and of ultraviolet, with the result that even the available amount of calcium is not fully assimilated. It looks like a conspiracy of "civilized" man against the element calcium; and this in face of the fact that this element plays such an important rôle in the physics and chemistry of our organism: Calcium is not only the main constituent of the bones of the skeleton, but it also is an essential part of the soft tissues and fluids of the body. It plays an important rôle in the coagulation of the blood; together with other elements it regulates the mechanism of the heart beat. Calcium is the most important element in maintaining the neutrality of the body. It is even capable (according to Meltzer) of correcting disturbances of the mineral equilibrium, such as caused by an excess of sodium, potassium or magnesium. Calcium is of prime importance in the maintenance of proper osmotic conditions, regulating the permeability of the membranes; it determines the stability or instability of the autonomic nervous system. Altogether, calcium is the most important constitutional factor in the animal household; and we have to expect a breakdown with a decided lack of such an important element; and we should suspect a weakening of the human constitution, even with a comparatively little deficiency in the calcium metabolism.

### Influence on the Vitamin State

The other important minerals are usually well supplied in our diet. This holds for sodium, potassium, magnesium, phosphorus. A deficiency of iron may occur in a diet that is too much based upon highly milled grain

products and milk, with an omission of meat, eggs and vegetables. A pronounced deficiency exists, however, in regard to the vitamins in any diet that consists of an excess of cooked food over raw food.

Vitamin A, growth promoting, antiophthalmic, is well represented in green leaves and yellow roots, milk, and egg yolk; but it is partly destroyed by heat. Grains, fruits, meats do not contain this vitamin.

Vitamin B, antineuritic (or better, physiological nerve stimulant) is well represented in vegetables, fruit, whole grain, milk, eggs, raw meat. It is relatively stable to heat. It is missing in the highly milled grain products, fats and oils.

Vitamin C, antiscorbutic, is found in fresh fruits, vegetables, raw cabbage and milk. It is strongly affected by heat. It is missing in the staple foods, in grains, in most preserved food, in cooked meat.

Vitamin D, antirachitic, is usually supplied by codliver oil, or nowadays by irradiated ergosterol. It is also supplied by yeast, green vegetables, milk and egg yolk. It is missing in practically all other foodstuffs. Mellanby goes even so far as to suspect an anticalcifying substance in cereals.

Vitamin E, the antisterility vitamin is supposedly present in milk and vegetable oils; it is stable to heat.

Starches and sugars do not contain any vitamins.

This review shows, how important milk and milk products, eggs and fresh vegetables and fruits and their juices are for the application of vitamins. On the other hand, staple foods, highly milled cereal products, white bread, starches, sugars, such as are widely used in the kitchen, do not contain any vitamins. And vegetables, fruits, meat, lose vitamins by the preparation of the food or by the preservation for the store.

Still, you may argue, that we are not suffering from xerophthalmia, beriberi, or scurvy, and that rickets and sterility are not as widespread as should be expected from these deductions; yet it becomes more and more apparent that these diseases are only the extreme results to which an extreme vitamin deficiency finally leads. But even a slight deficiency of vitamins causes a great number of ailments. Many are of a more general character: Lack of appetite, loss of energy, susceptibility to infections, malnutrition and retarded growth in children, intestinal disturbances, etc. In other cases more characteristic symptoms can be attributed to the lack of sufficient vitamins. Thus we have an increased susceptibility to infection of the respiratory organs, including the sinuses, caused by a lack of vitamin A; signs of cutaneous malnutrition, a muddy complexion, slowly healing wounds, by lack of vitamin A and C; so-called rheumatic pains in children and adults, teeth defects, perhaps pyorrhea, by vitamin C deficiency; and we know a great many diseases, particularly of childhood, pregnancy and lactation that are caused by the vitamin D deficiency. The vitamins A and D have a particular bearing on the prevention and healing of tuberculosis, and it may be significant that foods containing vitamin A and light are widely used in the treatment of this disease.

Summarizing, we have to admit that many diseases and ailments are caused by a wrong diet; and the source of the trouble must be sought in the fact that we eat too much denatured and too little natural food. The basis of our diet should be milk, eggs, vegetables, salad and fruits; and enough meat, bread and potatoes should be added to meet the individual caloric requirements. Instead of this, we fill up our stomach with the products of a highly developed kitchen chemistry and top off our meal with fruit or an ice cream, if any space is left. I do not know whether I am allowed to finish this chapter before this high tribunal with the statement, that too much physiotherapy is used in the treatment of our meals, in form of hydrotherapy, diathermy and massage.

### Our Gregarious Habits

Another habit I want to touch upon—for the sake of completeness—is the gregarious habit of man. This habit is the prime cause of the prevalence of infectious diseases in the human race; and medicine and health departments had a hard time to find means and ways to prevent and to combat these diseases. Statistics show clearly the prevalence of these diseases in large cities as compared with smaller cities and the countryside.

It is evident that the crowding of people in small tenements, street cars, cinema theatres, schools and churches favors the spreading of infectious diseases, and that environment and habits in large cities are not par-

ticularly apt to build up a healthy constitution to prevent and to combat these diseases.

It is a great step forward that the great "movie" houses are ventilating the rooms effectively and even keeping the temperature down in summer. It is promising also, that people prefer to move from the narrow interior of the cities for the more open spaces of the suburbs. A tendency toward greater privacy is also noticeable in the traveling by automobile and in the listening over the radio, and the coming television may have a similar effect.

### Work and Recreation

The last habit of man I want to deal with is one of the most problematic ones — work. The trouble with work used to be that there was too much of it, and the engine was heralded as a welcome means to reduce men's burden of work. Lately, the pendulum has swung the prophesied way; but now we have, so to speak, jumped from the frying pan into the fire; now we have too little of it. Politicians are at a loss to to find a remedy; therefore let us see what the biologist has to say about it. In his book: "Studies on Human Biology," Pearl devotes one chapter to the influence of physical activity upon mortality. He bases his deductions on English statistics on the mortality of occupied males between 15 and more than 75 years of age. He divides the 132 occupations into those of indoor and outdoor work, and each of these into 5 groups of increasing activities, from light to hard work. After discussing and eliminating most of the possible sources of error, he comes to the following conclusions:

(1) Light, medium and heavy work cause no difference in the death rate between the ages of 15 and about 45 years. From 45 years on, however, hard work increases the death rate, with a strongly increasing ratio for the higher ages. This makes it evident that "before age 40 is attained, it makes no difference in the rate of mortality, whether the occupation involves light or heavy physical labor. After, roughly, age 45, it appears that a man shortens his life, by definite amounts, in proportion as he performs physically heavy labor."

(2) The mortality is distinctly lower for outdoor than for indoor workers. This indicates the superior healthfulness of outdoor life.

I should like to add a few generally accepted premisses in order to build up the foundation upon which to base a few suggestions of an important social bearing:

(1) Work is healthful, mentally and physically, for men and women between 17 and about 45 years.

(2) Many modern professions require too much sedentary life and need outdoor recreation for compensation.

(3) Most, if not all professions, are very monotonous; their stupidifying effect should be overcome by a recreation that provides mental exercise.

Assuming the correctness of these premisses, one easily recognizes that the present system of unrestricted labor and unrestricted unemployment is wrong. The same thing would hold true for the dole system and any other charity measures, because they leave work and idleness distributed at random.

The only logical measure is to restrict work so much that every man or woman from 17 or 18 years up to 45 or 50 can be provided with work. A 5-day week and a 6-hour day would suffice at the present depression period to the needs of most countries. The rest of the time can be devoted to healthful recreation, as suggested before. This restriction has to be revised periodically according to variations such as caused by seasons and business cycles. The sick and the old should be protected from starvation and destitution by a compulsory invalid insurance, old-age pension, or a chance to accumulate enough capital for protection against emergency and old age.

I am convinced that such a scheme would correspond to the biological facts more than the present chaos, and I hope that the present depression period will give us the impulse to start it and to give it a trial.

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It was my intention, in this paper, to convince you of the importance and influence of environment and habits on health and disease. I could only cover or cite a few outstanding examples, to show you how, by the artificial change of our environment and by the uncritical adoption of unnatural habits, we are being separated from the soil, from which we have sprung. Of course, we cannot and we do not want to go back into the salt water, or to return into the trees; but we should, by all means, live a healthier life, more in accord-

ance with nature and more in conformance with the results of modern science.

From the evidence, as presented in this paper and in a former publication on environment, health and disease, I consider it as proven that a great number of diseases result from artificial changes of our natural environment and from adoption of unnatural habits. Therefore I am suggesting to the medical profession to suspect every environmental change and every unnatural habit as possible causes of disease. This hypothesis naturally leads to a more exact study of these environmental factors; it broadens out the etiological problems, and it leads to a better understanding of the position and value of physical therapy and prophylaxis. It points out the high task of physical therapy and prophylaxis in re-establishing the normal balance toward natural conditions which we have lost by the rapid development of civilization.

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# "COLD QUARTZ" ULTRAVIOLET ORIFICIAL IRRADIATION *

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More than 30 years have elapsed since Finsen successfully cured a case of skin tuberculosis with ultraviolet rays. Since then ultraviolet irradiation has been used with success in diseases, principally of the skin, on the flat surfaces of the body on which alone it was possible for the rays to be applied successfully with the hitherto comparatively crude methods.

Methods have since been devised to conduct the ultraviolet ray from its source to its place of application, and with these we are all more or less familiar. Kromayer was the first to demonstrate that mercury in quartz arc burners could be so modified as to enable one to use such a lamp for contact application. Since then other manufacturers have further modified their water-cooled ultraviolet sources so as to improve the quality of the instrument in several directions. All of the American manufacturers of this type of model are to be commended for their contributions in this direction. Unfortunately, in spite of all the improvements thus far introduced, certain notable objections in their instruments have not been removed. Although it is true that the apparatus is a definite improvement over the original model, the clinician who in the final analysis is the "last court of judgment," has felt that its ponderability, that is, its apparent clumsiness and the necessary dependence upon solid quartz applicators has acted as a restriction for its more popular adoption. It must be admitted that in spite of many deficiencies, these older models have been the means of permitting some very fine research to be consummated and has been the starting point for a new and valuable approach in ultraviolet radiation.

The new method of production and application of the ultraviolet ray is so great a departure from those methods we have had at our command in the past, that, in order to understand more easily its application and efficiency, it will be well for us to review some of the established laws of the action of the ultraviolet ray.

The distance of the source of ultraviolet irradiation from the parts to be treated, has an indirect effect on its potency. This is based upon The Law of Inverse Squares, which tells us that the volume of ultraviolet incident in a given area in any given time, is inversely proportional to the square of the distance intervening between the light source and the area irradiated.

To explain this let us assume that we have a volume of ultraviolet emanating from a certain source upon an area one inch square at a distance of one inch from the source of emanation during a period of one minute. There would, according to the law, be one hundred times the volume of ultraviolet rays falling upon this area in one minute than there would be on the same area during the same time if it were placed

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ten inches from the same source of the rays.

When this fact is recalled it immediately becomes evident that a careful system of treatment must be worked out, and that the more flexible the apparatus used the more efficacious will be the treatment.

Then there is another phase eminently important in the application of ultraviolet. This is the angle of which the ultraviolet ray strikes the surface being treated.

The Cosine Law, tells us in effect that the potency of an ultraviolet ray is reduced directly as the angle of incidence (using the terminology applied to light) is increased.

To explain this, when the ultraviolet ray strikes a surface at a right angle it has its greatest efficiency, but if it is made to fall upon the surface at an acute angle its efficiency is lost in a direct relation to the angle of its approach. According to Lambert's Cosine Law the intensity can be calculated according to the degree of the angle.

The physiologic value of the ultraviolet ray depends upon the amount of the ray that is actually absorbed by the tissue and this is governed by Grotthus' Law, or the Law of Photo-Chemical Reaction.

Now in a summary of these three laws, we find that if we are to increase the action of the ultraviolet ray:

1st. The source of emanation and the patient must be brought closer together.

2nd. That if an even distribution of ultraviolet application is to be accomplished the apparatus must be flexible and freely movable.

3rd. The mastery of the first two laws will accomplish in a great measure the third one, namely, that of ultraviolet absorption into the tissue.

The general attitude of the modern scientist, in fact, is to disbelieve every claim of a theoretic nature until it has been proved true; that is to say, until certain laws and scientific facts have been established to prove the claim.

Medical practitioners and specialists today are being influenced more and more in this direction and, in fact, are scientists. Even in the face of this almost skeptical scrutiny on the part of the specialists of the newer physical aids and hitherto inadequate methods of application, ultraviolet irradiation has grown in acceptance in the minds of the specialists and general physicians of today and is now as much a part of their daily method of treatment as are many of our old established therapeutic measures.

The ophthalmologist and otolaryngologist are among the greatest benefactors by virtue of the newer and more scientific methods of irradiation by means of ultraviolet rays. On the basis of personal observations I feel that the "cold quartz," orificial apparatus promises to revolutionize the use of ultraviolet irradiation in the treatment of diseases of the eye, ear, nose and throat.

The cold quartz orificial ultraviolet apparatus is light in weight and as easy to manipulate as the ordinary cotton applicator with which all otolaryngologists are so familiar. Yet no one should attempt its use without taking into consideration, the laws and facts concerning the use of ultraviolet rays, for here more than elsewhere in the body are the most delicate and sensitive organs to be treated.

Again, it is of great importance that much care and observance of the laws of ultraviolet ray application be exercised here, since in most instances the source of emanation and the parts to be treated are in such close proximity that the fullest intensity of ultraviolet ray is being delivered to the part; and while no serious consequences will result from an overdose, yet the immediate after-effect may greatly interfere with the continuance of treatment, which is not always satisfactory to the patient or physician.

The action of the ultraviolet ray on the living organism in moderate intensity is stimulating and, in high intensity, destructive.[1] Putschar and Holtz[2] were able to produce cancer in rats in 27 weeks by continually exposing them to ultraviolet rays; Vogt[3] shows that ultraviolet rays below 310 millimicrons, will burn the corneal epithelium, conjunctiva and skin; that ultraviolet rays in contrast to the light from the visible spectrum, are intensely absorbed by the superficial layers of the cornea, and that glacier burns are caused by the short wave ultraviolet rays.

Barney[4] relieved the distressing symp-

toms of ultraviolet burns of the conjunctiva by the use of calcium lactate and sodium, administered in large doses by the mouth.

The following investigators and many others have been quite successful in the treatment of ocular lesions with ultraviolet rays: Cardell[5] reported 181 cases, including phlyctenular ophthalmia, hordiolia, episcleritis, corneal ulcers and tubercular iritis. Caso[6] treated all forms of corneal affections; Denman[7] treated corneal ulcers with good results, del Duco[8] found the rays beneficial in herpetic keratitis. Duke Elder[9] treated corneal ulcers; Gasteiger[10] treated corneal ulcers and corneal wounds with great success; Gutmann[11] directed his research to the control of ultraviolet irradiation in the treatment of eye diseases. Nugent[12] treated corneal ulcers and trachoma with success.

Pascheff[13] claims that, in spite of much work and research both old and new, there is as yet no entirely complete understanding of the exact nature of trachoma; ultraviolet irradiation, however, is beneficial in its treatment. Furness[14] finds ultraviolet treatment beneficial in conjunctivitis, episcleritis, corneal diseases, trachoma and tuberculosis.

Goodman[15] states that there are many variations in the opinions of different schools concerning the value of ultraviolet irradiation in the treatment of various diseases; but there is no question, however, that such differences of opinion are rapidly disappearing.

Bachem and Reed[16] claim that ultraviolet ray penetration of the germinal layers of the skin (the corium) is great at 280 millimicrons, and from 250 down the absorption in the horny layers is increased until at 200 millimicrons it is complete. Bachem[17] also states that the action of ultraviolet rays in the skin diseases is partially local and partially general.

According to Gerrit,[18] the fact that some diseases, especially of the skin, have spontaneous remissions and recurrences, should encourage the continued treatment with ultraviolet rays for a period after the disease has apparently subsided.

To date we have met with the most gratifying results in the treatment of the following eye infections: corneal ulcers, phlyctenular ophthalmia, conjunctivitis, blepharitis, episcleritis, herpetic keratitis, pseudo blepharitis and skin erosion, especially at the external canthus. Not only do certain diseases of the eye benefit under the influence of ultraviolet rays, but the diseases of the external ear, nose, mouth, throat and larynx also come in for their share of improvement.

The orificial "cold quartz" tube makes it possible to place the source of ultraviolet rays directly in the external auditory canal, thus creating an ideal method of treatment for ulcers of the ear drums and of the walls of the external auditory canal, as also for furunculosis keratosis, and other forms of external ear affections. Here, by virtue of the natural anatomic conformity, the most important laws governing ultraviolet emanation and absorption are adhered to:

1st. The close proximity of the source of ultraviolet rays to the area to be treated.

2nd. Most of the emanating rays strike the surface perpendicular to it.

3rd. The absorption is therefore at its maximum. Certain skin affections of the pinna such as dermatitis, keratosis, and local eczema respond to ultraviolet irradiation.

In the throat and mouth we have met with success in the treatment of buccal ulcers, herpes of the lips, stomatitis, pyorrhea, trench mouth, ulcers and broken down follicles of the tonsils, Vincent's angina, and ulcers of the pillars and palate.

Perhaps one of the greatest phases of importance is the fact that this type of apparatus makes it possible to carry the ultraviolet source into almost direct proximity with diseases of the larynx. It has long been recognized that sunlight is of great value in treatment of laryngeal affections. Wessely[19] in 1923 devised an instrument to treat laryngeal tuberculosis with the carbon arc light, which he called concentrated artificial sunlight. Moore[20] reported 49 patients treated by himself, in Vienna, with artificial sunlight with success. Miller[21] in a very recent paper stated that he had treated 74 patients suffering with laryngeal tuberculosis with artificial sunlight, all of whom responded favorably except two, one an old man 73, and the other a young girl of 20. He comments that, "both of these patients were frail and their condition was

too far advanced, they had no regenerative power."

Now if these investigators in their commendable work can secure such good results, with an apparatus which delivers only a comparatively weak amount of ultraviolet rays, and is so constructed as to render it next to impossible to deliver a therapeutic dose of ultraviolet on the area to be treated, it is not at all difficult to conceive the advantages of the newer form of apparatus in treatment. Ultraviolet irradiation has proved quite successful in the treatment of laryngeal affections.

It is obvious, even to the casual thinker, that the "cold quartz" orificial tube would be a great advantage over other forms of ultraviolet ray apparatus, and the ease with which the source can be carried in close proximity to the affected parts, is also more than attractive in nose affections. Acne rosacea, chronic atrophic rhinitis, septal ulcers and ethmoiditis have been benefited by its application.

The duration of treatment with the cold quartz orificial apparatus is from twenty seconds to three minutes, the average treatment being from one-half to one minute.

In the Chicago Eye, Ear, Nose and Throat Hospital we have treated with the cold quartz orificial tube 1028 patients during the last five months. This involved 2572 treatments or an average of two and one-half treatments per patient. The range of treatments was from one to seventeen. The following table shows the number of patients treated in the various departments:

| | |
|---|---|
| Mouth | 14 |
| Eye (Exclusive of all corneal ulcers which are treated with the Birch Hirshfeld Radiant Lamp) | 101 |
| Ear | 380 |
| Nose | 432 |
| Throat (Including treatments to the larynx) | 101 |

Many of the above patients were treated with the cold quartz only, and many received other treatments at the same time. The results were, on the whole, much more gratifying than we had expected. Only eight cases were unsatisfactory. Of these eight, six patients should never have been treated with ultraviolet rays as their condition was not such as would respond to this treatment.

In some cases we have only a notation that the condition had improved, the patient not having returned for further and complete treatment. In a fair percentage of these cases we are justified in assuming that the condition was cured. There are some, especially those who received only one treatment, of whom we have no account as to the results. But in those cases in which we were privileged to follow the patients through the entire course the results were very gratifying.

## Summary

The "cold quartz" orificial apparatus has demonstrated to us that it is superior to all other forms of ultraviolet irradiation apparatus in treatment of affections in cavities, and small areas on the body surface.

It is unusually well adapted for the treatment of diseases of the eye, ear, nose and throat.

Our success with the use of ultraviolet irradiation in certain diseases, of the eye, ear, nose and throat, has been gratifying.

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# THE PSYCHONEUROSES FROM THE STANDPOINT OF DIAGNOSIS AND MANAGEMENT AS CONCERNS THE INTERNIST *

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One of the most important problems of the subacutely and chronically ill patient is that of the psychoneuroses in their various manifestations. Every organic nervous disease has a certain psychoneurotic element and practically every presumably normal individual is potentially psychoneurotic under sufficient stress, but the threshold varies in different individuals. The world war demonstrated this in a striking manner. The physically healthy soldier boy who in peace times showed no evidence of nervous instability under the stress of war very frequently developed psychoneurotic manifestations often of a profound nature. It is well recognized that we owe much of our progress in the world to the psychoneurotic. They represent the creative force of the world very largely, and, on the other hand, they have done much to retard progress by their fanaticism and extreme views. It is from their ranks that criminals, addicts, perverts and extremists of various kinds are principally recruited. They are often fond of display and publicity and are given to moods of exultation and depression. Fear is often an overshadowing symptom and may manifest itself in ways that are almost legion.

Medicine has too fully focused its attention upon organic disease at the expense of pathological physiology, the disturbances of function. I think it must be accepted that functional disturbances may eventually result in pathological changes, such as so-called essential hypertension eventuating in structural cardiovascular changes, and practice teaches us that the psychoneurotic element plays no small part in the management of the organically sick individual. Again the psychoneurotic may have ills that may be entirely overlooked.

Diagnostic surveys indicate that approximately 50 per cent of the subacutely and chronically ill are represented by the psychoneuroses without recognizable evidence of organic disease. It is estimated that at least one-third of the patients suffering from various digestive disturbances are represented by nervous dyspepsias and no small per cent of this group are born nervously unstable. Woodyatt states that the power of emotions to produce physical alterations does not seem unreal. Fitz of Boston in making a survey of

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hospital admissions found that a strikingly large per cent of cases admitted to hospitals are suffering from no recognizable organic disease.

In spite of the tremendous advances in the science and art of medicine in recent time, the management of the psychoneurotic is not materially better than in the past. Group practice, the depersonalizing of medicine, and, I may say, the tendency to commercialization of medicine are not helpful in the more satisfactory management of the psychoneurotic. The passing of the family physician with his intimate knowledge of the individual from the cradle to the grave has added to the gap of unsatisfactory care of the psychoneurotic. If you do not include the psychoses of a more profound nature, the problem more largely belongs to the internist not only from the standpoint of diagnosis but treatment.

The cause or causes contributing to the psychoneurotic state in most cases are obscure. Many theories are advanced which are more or less in reverse ratio to our definite scientific knowledge, and these theories too often become cloaks to be used to cover up our etiological ignorance. Psychoanalysis may give insight but surely does not reveal the whole truth. The application of complicated psychoanalysis routinely in diagnostic surveys is not practical, neither is it justifiable nor necessary. As an approach to the problems we must gain an understanding of the childhood conflicts, the maladjustments, and the distorted love life. Too little attention is given the emotional factors and the part they play in disturbing function either with or without organic changes. It must be admitted that constitutional make-up, hereditary factors, represent fertile soil in which the neuroses take root and thrive. We must find out the personality and determine if possible the disturbing factors which contribute to the various reactions termed psychoneuroses. It is this soil that nourishes the psychoneurotic state precipitated by organic deficiencies, shock, physical. emotional strain and fatigue.

It will not be my purpose to discuss the severe neuroses that more properly belong to the psychiatrist but analyze the psychoneurotic states as found in the routine diagnostic studies of medical surveys in hospital, office, and consulting practice. It shall be my purpose to briefly analyze a series of 15,700 cases studied in the last eight and one-half years. Of this series 6,286 cases were seen as ambulatory cases and 9,414 cases were hospitalized. The latter series are referred to only from the standpoint of morbidity incidence to the total medical cases admitted to St. Luke's Hospital over the period of eight and one-half years. It will not be my purpose to enter into a detailed discussion of the diagnostic problem presented by this series of cases. The cases on whom no recognizable organic disease was found were as carefully studied as the cases on whom organic disease was diagnosed and a neurosis was in association.

The diagnosis has many pitfalls, and an overshadowing history of a neurosis too readily leads to interruption of a diagnostic survey sufficient to reveal obscure organic disease. Again, the neurotic not infrequently becomes the subject of repeated unnecessary special diagnostic procedures as he shops about seeking medical relief, and as Alvarez very aptly says, "The more scientifically trained the physician is the more likely he is to offend against these poor patients because he knows of more things to do." We must recognize their constitutional inadequacy and not hope to effect a complete cure. It is the internist who by training and interest is best able to study his patient as a whole. The human body and mind must be regarded as a unit and one cannot be separated from the other. Obviously, this fault in medical practice adds to the patient's contempt and disappointment which helps him to take up with the cultist and faddist where at least he not only is told what his illness is (which always visualizes something organically at fault) but in turn in equally positive terms he is told the remedy.

We hear it said not infrequently that the incidence of the neuroses is increasing as a result of the added responsibilities and complexity of modern life. It must be true that the psychoneurotic is diagnosed much more definitely than in the past, but whether we are becoming more and more a nation of neuroses must represent an opinion. The general dissemination of medical knowledge to the laymen as a result of health campaigns and increased sources of information such as the radio and lay magazines, should bring a better understanding about the simple facts of disease and lessen the faulty thinking based on superstitution and ignorance. It remains

to be seen whether the education of the public in things medical will have a helpful influence in lessening faulty thinking which has always characterized the psychoneurotic state. My own impression has been that increased smattering knowledge of disease on the part of the laymen very often leads to phobias in the nervously unstable.

In the period of eight and one-half years from January 1st, 1923, to date, during which time 6,286 cases were studied in my office and consulting practice, 1,428 cases of 22.7 per cent were shown to have definite psychoneurotic manifestations. There were 758 cases or 12 per cent of this series unassociated with organic disease in any form. The patient with recognizable organic disease may have little or no attention given the associated or superimposed psychoneurotic manifestations, especially if the organic condition is of serious nature; and this may be unfortunate for his satisfactory management. It is always a question, which is the cart and which is the horse in this type of patient. Are we dealing with a psychoneurotic who has developed organic disease and perhaps accentuated his psychoneurotic state, or is the psychoneurosis purely superimposed and brought to the surface by reason of his organic illness? A careful history and subsequent behavior generally tells the story.

In view of the common belief that modern life is producing more and more psychoneurotics it seemed to be of sufficient interest to warrant determining the ratio of psychoneuroses to the total cases studied in two series where statistics were available, the one the series studied in my private office practice, and the other the medical cases admitted to St. Luke's Hospital. Of 9,414 medical cases admitted to St. Luke's Hospital over this period of eight and one-half years, 762 or 8 per cent were diagnosed as psychoneuroses in some form. Obviously, the psychoneurotic more often represents the ambulatory case and, therefore, does not seek a hospital bed which in part accounts for the much lower incidence of the cases admitted to the hospital. Another factor is faulty diagnosis. The inexperienced house officer too readily visualizes organic disease without sufficient confirmatory evidence, and loose diagnoses result in faulty diagnoses. It is probable that a statistical study of cases studied in the out-patient department would show a large incidence of psychoneurosis, which to my mind is poorly handled even in our best regulated ambulatory clinics.

A graph has been made of these two groups of patients to visualize the ratio of neuroses to total cases studied to determine fluctuations according to the years of prosperity and depression. This group does not visualize an increase of the incidence of the psychoneuroses incident to years of economic depression such as we are passing through.

A further classification of the cases studied in my office may be of interest. The ages ranged from 15 to 65 years and were grouped as follows:

147 cases between 15-25 years
414 cases between 25-35 years
389 cases between 35-45 years
288 cases between 45-55 years
153 cases between 55-65 years

There were 894 females and 534 males; 1,090 were married and 338 were single. There were 605 cases diagnosed as psychoneurosis, many of whom had bizarre symptoms. This group included the hysterias, phobias, anxiety neuroses, hypochondriases, etc. There were 317 cases diagnosed as gastric neurosis and nervous dyspesia; 301 cases as neurasthenia; 149 cases as a general neurosis; and 22 cases as cardiac neurosis. Twenty-six cases were diagnosed as psychosis not satisfactorily labeled, such as pre-senile, etc. It may be of interest to briefly review the following case histories which represent various psychoneurotic reactions:

Male, aged 43, with a good family history, contracted spyhilis at the age of 24 for which he was given intensive treatment and was apparently clinically cured; after which he developed a typical initial lesion following exposure, which disappeared promptly with anti-leutic treatment. Being the nervously unstable type he developed bizarre nervous symptoms and became quite introspective thinking that every fleeting pain, headache or feeling of fatigue was in some sense a syphilitic manifestation. This feeling was aggravated by the faulty advice of another physician "that no doubt the lues from which he had suffered was responsible for his symptoms." It took a period of years to convince him in spite of reported negative lumbar punctures and negative blood Wassermann's that his syphilitic disease was clinically cured. It is only since he has become the father of a healthy child that he has completely dismissed the idea that syphilis is lurking about.

A married woman, aged 43, with a good family and past history, developed a lumbago and sciatica coexistent with a hyperplastic endome-

tritis at a time when a friend became seriously ill with a uterine malignancy, with which she associated her condition. She refrained from seeing a physician for a period of months after the above described symptoms arose on account of the fear of being told that she too was suffering from a malignancy. In spite of a careful diagnostic survey and a confirmation of the diagnosis, there was entertained a deep fear that she was not being told the truth about the real nature of her symptoms. Persuasion and assurance that her condition was definite and not malignant has finally convinced her. It is this type of psychoneurotic disturbance that physiotherapy plus symptomatic medication adds materially to successful management. Indecision or uncertainty on the part of the medical man can do untold harm where the soil is so fertile for faulty suggestions.

A married man, aged 33, seen recently gave the following history. Mother died a few months previous from peritonitis resulting from a ruptured appendix. Soon after he developed discomfort in the right lower quadrant, felt feverish, and immediately decided that he too had appendicitis. Careful examination revealed no signs of appendicitis nor a history of previous trouble. He was immediately convinced that he had developed an erroneous idea about himself and left the consulting room with a feeling of relief. It is this type of case that uncertainty on the part of the medical man contributes to an accentuation of the anxiety neurosis.

A married man, aged 37, complained of pain in the left shoulder radiating down the left arm which was not paroxysmal in nature. The routine physical examination and all laboratory findings were negative aside from a systolic blow over the praecordium but no other sign of heart disease. He had been told by another physician that he had heart disease, who cautioned him about exercise, etc. As a result he became profoundly introspective about himself. A number of consultations and letters to his physician as well as himself finally persuaded him that he was not suffering from heart disease.

A single female, aged 43, consulted me with the following complaint; vague feeling of nervousness, unrest, pain in the right lower quadrant radiating down to the rectum, menses regular but more scanty, last period passed bluish membrane after which she experienced a sense of relief from annoying symptoms. She had convinced herself that she was suffering in some vague way from absorption of poisons from her uterus. It was found on pelvic examination that she had a moderate degree of retroversion, otherwise negative on examination under anesthesia. As a result of the examination she experienced complete relief of all annoying symptoms which returned on the giving of a simple vaginal douche. She again insisted on another examination under anesthesia from which she again experienced complete relief.

The management of the psychoneurotic is a story that cannot be completely told by the one who has the experience. It requires primarily individual case management. The confidence of the patient cannot be satisfactorily obtained if a careful study has not been made. If an underlying organic condition is present it must be properly treated but the patient cannot be satisfactorily handled by the specialist alone to whom he may be referred for the underlying organic condition. He cannot be told that he is just a neurotic and his trouble is in his head. No doubt, he has been told already that he is a neurotic and that he should forget about it—very commonplace but unintelligent advice. No one can satisfactorily manage the psychoneurotic without appreciating the importance of a sympathetic understanding of the patient's condition. Effort should be made to correct faulty living conditions, faulty thinking and faulty environment. Excesses as represented by habits and dietary should be corrected, and diversion and exercise (consistent) should be a part of the program of every psychoneurotic. The sex problem must be openly and frankly discussed. Maladjustments must be analyzed and clarified as relate to the sex urge, sex repressions and sex life. My own experiences have taught me that if you cannot inspire the patient's confidence you had best tell him to get another doctor. Liberal doses of persuasion and suggestions properly made play an important part.

Physiotherapy is an important adjunct as well as inoffensive medication. Anything that will improve his faulty physiology will be helpful. I have no deep convictions about physiotherapy whether it has physiological value or purely psychic effect. The lessons in the World War in the handling of the psychoneurotic and the value of physiotherapy in its various forms were striking. No modern hospital can claim to have adequate facilities for the handling of medical cases without a complete department of physiotherapy and occupational therapy. Such a department should be directed by a well-balanced medical man. I regard the psychoneurotic in the same manner as the chronic rheumatic. Both groups represent the neglect and failure of medicine and both groups are amenable to satisfactory management if we rationally apply the means at our command.

# VALUE OF ZINC IONIZATION IN SELECTED CASES OF SUPPURATIVE OTITIS MEDIA *

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A continued suppuration in the middle ear frequently is the result of some cause which keeps up the suppuration, and is beyond the influence of medicinal means, such as ordinarily used in our treatment of this common condition. For that reason the profession is on the constant lookout for new ideas, discovies, or methods of treatment.

The most important and first consideration in our treatment of otitis media is the same as any other pus cavity; namely, adequate drainage or obliteration of cavity in which the pus may form. And since this is one cavity which has no collapsible walls, we have to direct our efforts to proper drainage, a fact which often leads us to other methods beyond the scope of this paper. To secure the best effect, the hole in the drum membrane should be large and low enough for favorable drainage.

In dealing with the middle ear, we are bound to consider the eustachean tube. Since this is the most important means of drainage, we should remember to remove any adenoid or tonsil tissue, even if small in amount, especially if this happens to be the upper end of the remaining tonsil. I am supported in my radical attitude, that otitis media is as much a naso-pharyngeal as an otological condition, by competent and recognized authorities. Coats, of Philadelphia, feels that he would not treat an otitis media in a child unless the parents would let him remove the adenoids. I also heard Harold Hayes, of New York, say that there was no use treating an ear as long as there was even a small piece of tonsil tissue left in the tonsil fossa.

After considering the mechanical condition of our immediate area, we should also consider our patient, since we must remember that we are treating a patient and not merely an ear. As a rule our patient does better if all his other organs are functioning normally. As an adjuvant to our treatment, vaccine therapy may also be introduced, this to be determined by the nature of the discharge and the type of organism found therein. I am convinced that there is in this a certain degree of specificity by means of which the resistance of the part is favorably influenced.

I have somewhat generalized in leading up to the more definite treatment, which we are prone to leave until we have tried other means and failed. Otitis media may at times be so complicated as to require surgical intervention. It is, however, difficult at times to differentiate the medical from the surgical type. Often they seem to coelesce and can only be distinguished by the therapeutic test, that by zinc ionization. We may be mistaken in our decision in the treatment best suited for a given case, and be surprised how rapidly they will clear up under this treatment after failure of other good and recognized treatments. In fact, this is the rule: if we get results at all, it will be with a few treatments. It is my opinion, if we do not get results after five or six treatments, we need not persist as we are not liable to obtain improvement by further treatment. The results with this form of treatment have been in my experience, and apt to be for anyone, far beyond expectations. Many of my cases have been promptly freed from discharge with one or two treatments, cases which have resited all other forms of treatments.

It becomes obvious therefore that the treatment of zinc ionization is suitable only in selected cases. The types of conditions most amenable to this form of treatment can roughly be listed as follows:

First: A chronic case that has not cleared up under any good treatment.

Second: The patient should prefarably be an adult, — one, at least, that will co-operate with us. I do not believe it is best to try to treat children as they will not remain quiet long enough for fear of being hurt. One should therefore be overly careful in treating children in order to prevent sudden movements which might interrupt the current flow and produce electrical shocks. At best, the treatment is somewhat disagreeable to the child and a trial to the physician or nurse.

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Third: An ear with a fairly large hole in the drum membrane, and a tube through which air may be pulled by a slight suction.

Fourth: An ear with no bony involvement, or colestioma, or obstructive granulation tissue, either in the ear or the nasopharynx as may be shown by x-ray or the pharyngoscope. Cases with sinus infection as a cause do not clear up satisfactorily under this form of treatment. I know of no actual harm from this form of treatment, but on the other hand it is best to use it only in such cases where it will result in the quickest benefit to the patient.

When we have decided to treat our patient by zinc ionization, one of the first questions that comes to our mind is, How far will the electric current drive the ions into the tissue by ionization? In the first place, this will depend on the strength of the current, the length of the treatment, and the kind and nature of the tissue to be treated. We should not expect it to penetrate to the depth in an old fibrous thick adhesive as in an ear more normal.

I have experimented on beef steak with a three milliampere current for ten minutes and found that it would drive the zinc an inch into the steak, and that the albumen in the tissue inside the insulator was coagulated. However, I have never noticed anything more than a faint milky appearance to the drum membrane of the auditory canal from the astringent effect of the zinc and the positive current. The milky appearance clears up in a short time with a very little, if any, reaction.

We have abundant proof that ionization actually produces deep tissue reaction and penetrates beyond where the solution actually comes into contact with the tissue. If this were not so, there would be but little excuse for subjecting our patient to the disagreeable sensation of the current in the ear. However, I am sure that our results are better in the cases with a large opening in the drum membrane, which allows the zinc solution to come into contact with the mucus membrane and diseased tissue.

If my results are any better than those of my colleagues (and I frankly question this) it can only be attributed to the preparation for treatment which they receive. Otherwise my technic is the same, as I use the current about as others do. But it is as with so many other things that make such a difference in results, and it may be some little thing that may have been overlooked in the preparation or treatment that changes our final results. Permit me therefore to describe my personal technic in some degree of detail.

I first cleanse the ear, or wipe away all pus with a cotton-tipped applicator. Second, I apply a wet suction tip that fits the auditory canal accurately and connect it with a water suction as it is more comfortable to use. If I use a suction machine, I am careful to set the negative pressure at about ten, or not more than fifteen pounds negative pressure, and see to it that the tip sticks tight enough to exclude the air. Then, I ask my patient to hold his nose air-tight and to swallow two or three times without turning his nose loose while there is a constant suction in the ear, and I am almost invariably rewarded with several drops of pus. If any air passes up through the tube, air bubbles can be seen on examination of canal, due to the fact that when one swallows, the Eustachian tube is open which allows air to pass up through the tube and middle ear and brings the pus with it. If the tube is not open enough to allow air to pass, we will not get very good results from our treatment, unless the zinc by its shrinking effect on the mucus membrane, causes the tube to open up and allow better drainage. It is my opinion that this is what occurs which produces our favorable results.

I am never alarmed if there appears, after suction, a drop or two of blood. This only means that our suction was too strong, or that we have run into very sensitive new granulations. If the latter happens, I never discuss it with my patient, but proceed in the same manner as though no complication has arisen. In fact, I have thought the blood clot, in some cases, seems to help close the hole in the drum membrane when the suppuration has about cleared up. Then, following the suction, we should use any chemical disinfectant to further cleanse the ear. I believe alcohol is the best. The pure alcohol does not cause very much pain and does as well, or better, than anything we can use in the ear.

Our patient is now asked to lie down on his side with the ear to be treated to extend upward. The canal is filled with a warm one per cent solution of sulphate of zinc, and a zinc

electrode, insulated by a bulbous pointed glass tube is placed in the ear into which is added several more drops of the same solution. This electrode should be connected with the positive pole of a galvanic battery or instrument. The negative is placed in a large pan of salt water, into which the patient places his hand, as this is much more comfortable than treating with a pad.

The current is turned on slowly and allowed to run up to only one, two or, at most, three milliamperes, and continued for ten minutes. The more acute the case, the less current we are apt to use with comfort to our patient.

I use an ordinary house current with a rectifier, although it is claimed that the old battery is less painful. One caution we should stress is to keep our terminals in our batteries or transformers free from accumulated sediment, a situation when present which causes us to turn on a rather strong current before the resistance is overcome, which comes on with a jerk, and is very disagreeable to our patient. If our rheostat and terminals are working properly, the current should come on evenly and smoothly, and should be turned on and off slowly. A treatment every two or three days is often enough and our patient often speaks of how clear his head feels and how much better he hears after the treatment. It is my opinion that the good effect comes, first, from the astringent shrinking effect of the zinc, allowing better drainage and limiting somewhat the formation of pus; and second, the acid effect of the positive pole, an effect which is opposite to that encountered in inflammation or inflamed tissue. As it is acid, it is not conducive to pus formation.

The solution left in the ear should be well drained out, but no other medication is necessary after ionization treatment. Any regular treatment may be carried out on the days you do not use the zinc ionization. This, with the treatment of nasopharynx to produce proper areation will cure or relieve many cases. I think the favorable results can be advanced about fifty per cent of those cases that have not yielded to other treatments.

## Conclusion

I am convinced that zinc ionization should be used in cases which do not yield to other forms of treatment, providing of course, that the condition is not of a surgical nature. Thorough removal of all pus from the tube and middle ear, so as to allow the zinc solution to come into contact with diseased tissue is the most important part of the treatment. In my experience, three milliamperes for ten minutes at each sitting was sufficient to provoke favorable results, that is to say, they were about 50 per cent better than by any other known method.

301 North Seventh Street.

## Discussions

**Dr. Ellis G. Linn (Des Moines, Iowa):** Mr. Chairman, Dr. Walker has presented a paper, some features of which I should like to discuss briefly.

First, as to the preparation of the patient, I usually prepare mine somewhat differently from the way he does, but the result is essentially the same. There is the thorough cleaning of the middle ear. I have usually followed the practice of using the Eustachian catheter in forcing some air through the tube so that I can then feel that I am working in an area that is pretty thoroughly dry.

I clean out the middle ear, cleansing it with the alcoholic preparation. If the ear has granulations, I follow the procedure that you all follow in cleaning them out. If there are debris that are devitalized, I take those away. I have an ear, in fact, that is in a condition to get better if properly treated.

The central perforations of considerable size will yield more quickly, more than likely, to treatment. A small perforation is perhaps not often one that would be chosen for this procedure. The perforations, if large and central, will yield the best results.

The turning on of the current is a thing which has had the attention of every man who has handled galvanic current about the ears to any extent. In my talk I am assuming that I am speaking to some who do not specialize in ear work. If so, let me emphasize what Dr. Walker mentioned, that the current is to be turned on extremely slowly. You wouldn't exceed three milliamperes of your probable maximum. You will be three or five minutes in reaching that maximum of current.

As to the strength of the solution used, I prefer a 2 per cent zinc sulphide solution. I know that is not the rule. That is no reason I shouldn't use it. It does no harm to use a 2 per cent zinc sulphide solution. It will do no harm to use a 10 per cent solution. I prefer the 2 per cent. I think there is a probability that there is a more constant supply of the zinc ions reaching the pathological structure if I use a 2 per cent. Ten minutes is the time usually specified that the current shall continue to run. I almost uniformly run the current fifteen minutes. I find no objection to that. It seems to me I get better results.

In turning it off I take as much time as I would

in turning it on. You find just as much vertigo resulting from turning it off too fast as you do from turning it on. You should take as much time turning down the current as you do in reaching your maximum.

There is coming from the perforation, after you remove your speculum and dry out the ear after ionization, an exudate which has come up from the middle ear as a result of the electrical process and the ionization. It is usually a milky, creamy, thick substance and I always clean it away, drying out the ear, after the solution is used, very carefully. Then I have found it advisable to use, following that, a powder blown in. It consists of boric acid and iodin. It is prepared. You can obtain it readily. There are several makes of that. Should there be any moisture remaining, the iodin content of that powder is released, and you get the iodin fumes in the middle ear, which in themselves are aseptic and have a helpful, stimulating, supporting effect.

Other measures, of course, are to be used, as the speaker has mentioned. You do everything in this type of case that you would do in the other cases. Of course, you wouldn't expect to heal an ear in a patient where there was a throat containing diseased tonsils or in which there were adenoids present. If you don't clean that away you would be in just the same situation as that described by Dr. Wahrer in his clinic this morning. You would find a recurrence of the thing in a little while. There is no use to try to smother a fire with straw. You had better clean up the throat as you would in other serious procedures. If there are adenoids get the nose in good condition, because you will be disappointed if you do not.

As to repetition, it is almost always stated that a few treatments will suffice. I could never see why you should not be permitted to repeat ionization as you would repeat other procedures that are presumed to be helpful.

I have failed to obtain a cure in a case where I thought there should be good results in ionization. Treating it about as frequently as I generally do, I have dropped off the treatment for a lapse of two weeks or so, and then repeated it probably eight or ten times before I got my ear well. As to the particular ear about which I am now thinking, I guess the lady was 35 of age. That is as old as a man should guess a lady's age. She was three years old when an attack of measles resulted in a chronic suppurating ear. That would be perhaps more than thirty years that her ear had been suppurating fairly constantly. The length of time it took to cure that ear was possibly two or three months. I cannot see why I should not be permitted to repeat ionization as I would be permitted to repeat other methods of treatment.

Is it to be used in young people or children? The Doctor has suggested that they are nervous and restless and the contact is broken. You have no business to permit a contact to be broken when you are ionizing an ear. A little one will tolerate it fairly well unless he is extremely small. I would use it on little children three or four years of age. I don't see why I shouldn't. A child can be induced to lie still. It is a uniform thing. It doesn't cause a noise if it is turned on slowly. I can see no reason why a child should not be treated.

Of course, you select your cases. No one would ever think of using ionization in a case of cholesteatoma. That isn't a condition that is to be treated by remedies. You clean out the cholesteatoma and still you would not think of using ionization and expect a result, because you would be disappointed if you did. That is an operable situation.

Selected cases that can be benefited by remedies or other lines of treatment will many times yield to zinc ionization.

As to the depth of penetration of the ion element, I do not know. I would not expect to be able to drive them very far into living tissue. The circulation would carry away pretty much any elements that did reach that depth. It is not likely that you ever need to drive them more than 2, 3 or 4 mm. into tissue. There may be a necrotic tissue there, but if you can successfully drive the zinc ions 2 or 4 mms. into the tissue you are perhaps successful in a majority of your cases.

As to percentage of cures, I suppose there are no figures available that would tell you the percentage of cures that you may expect. Your experience will tell you that more quickly than anything else.

If you will examine a case with great care and after doing just what Dr. Wahrer told you this morning, preparing your field, follow up carefully the procedure, you will find it very satisfying.

**Dr. A. R. Hollender** (Chicago): Zinc ionization is a favorite subject of mine and I can hardly let the opportunity pass without offering some discussion.

I believe our poor results in the treatment of chronic suppurative otitis media have been due, in a large measure, to the fact that we have adhered too strictly to textbook methods. We have been prone to take advantage of our patients in that we have not sought some of the procedures which have offered the approved methods in the past ten or fifteen years. By this I mean that the average otolaryngologist who came in contact with a chronic suppurating ear was satisfied with some cleansing procedure and with a prescription to the patient of some borated alcohol and sent him away with that. After a time, if that didn't dry up the ear, it was just too bad; the patient had to continue to have a running ear for the rest of his life.

Of course we all agree, we all know, that in order to effect a cure in these cases, if a cure is possible, it is necessary to give the necessary attention to the nose and the throat and the pharynx and so on; in children, the adenoid factor, in adults, the nasal factor, and so on.

We are assuming that proper attention to the nose and throat is the foundation for any method

which we might select and which we might put into effect to cure a case of chronic suppurative otitis media.

I do not think it would be fair to pass this subject without mentioning that a great deal of credit is due to Dr. Friel of London, who really pioneered zinc ionization in chronic suppurative otitis media. Friel has done a tremendous amount of work and with such a degree of fineness that I don't believe anybody in this country has ever equalled it.

Those of you who have had the pleasure of seeing Friel demonstrate his method and the fine points in connection with it when he was present as one of our guests about three years ago will appreciate what I have said in this regard.

One of the important things, of course, in treating any case of chronic suppurative otitis media is the selection of cases, and the diagnosis. It would be unfair to any method, to any procedure, to take every case of chronic suppurative otitis media in our office and treat it promiscuously with one method or another method, just routinely. That sort of thing does not get results, and you and I know it.

The question of apparatus was not discussed (at least I didn't hear it) by the essayist, and I regret that exceedingly. When I first started to use zinc ionization in chronic running ears the matter of apparatus was the most difficult one for me. I got tired of holding the speculum in the ear. You might say, "Well, why didn't you have the nurse hold it, or your assistant?" Well, she or he gets tired of holding it, too.

This fussing around in children is one of the things that led my former associate and myself to look for some improved apparatus for this particular work.

I agree with Dr. Linn fully and disagree with the essayist that you cannot carry out zinc ionization in children. I have done zinc ionization in children one year old, and have had no difficulty in doing it. Of course, it is much simpler, much more convenient, to do it in an adult, but it can be done in children and it can be done more successfully in children. That can be explained because the pathology is different. We all know that the pathology is the basic factor in these cases. As chronic inflammation progresses we have a more difficult problem to overcome with any method that we might use.

With reference to apparatus, I should like to show once more this simple instrument which was devised by my associate and myself several years ago. It is a simple, adjustable head band that fits on anybody's head. Dr. Balmer is a good subject to demonstrate it upon. To those of you who haven't seen it in use I want to show you how I use it. Your patient is lying down, of course. I won't fit this very tightly.

You observe here laterally the attachment for zinc ionization, which simplifies the procedure very, very much. Here is your pad for the inactive or negative electrode, which is adjusted to the under side of the head band over the region of the forehead. The maneuver is simple in preparation for giving treatment. The locking of this head band about the head and the attaching of the cords to the proper terminals is practically a one act movement. The electrodes are held in position, automatically. The nurse or physician is thus released from a tiresome duty of holding an electrode in place, and trying to adjust the current at the same time.

With reference to the time factor, it is a recognized rule and Friel has repeatedly stated that it requires 15 milliampere minutes. Fifteen milliampere minutes is a minimum to obtain any kind of results with zinc ionization. If you are able to use three milliamperes of current, which some patients will tolerate without vertigo, it is only necessary to carry out that treatment for five minutes. That gives you 15 milliampere minutes. If you are able to use only one and one-half milliamperes, you will have to carry out your treatment for ten minutes. That still gives you 15 milliampere minutes. If you are only able to use one milliampere, as some patients will tolerate, you will have to carry out your treatment for fifteen minutes.

It is true that this is strictly an arbitrary affair. Some will get results with ten minutes, some with five minutes, but if you want something for a working basis, to my mind this is a most practicable thing. I mean after the maximum of current is reached.

Just one or two other points. I like to inflate the ear, as Dr. Linn does, with a catheter. I am very much opposed to politzerization or to the patient's using the old Sylvester method of inflating the ear. I like to use a solution similar to the one suggested by Dr. Friel, and the strength of that is one-fifth of one per cent. I think the stronger the solution the more irritating it is; at least, that has been my experience. It is more difficult to obtain results, particularly in children.

I like to follow up the treatment with a powder. I used to insufflate some ordinary boric powder into the ear, but recently I have come to use the so-called boric-iodin powder. The boric-iodin powders I find are very effective for the treatment. As a matter of fact, since this boric-iodin treatment was suggested by Dr. Sulzberger of New York, I have found that I have been able to dry up a great many ears with the powder alone, without zinc ionization. You will find a great many cases that will not respond to the powder; you will find a great many cases that will not respond to zinc ionization, but you will find a great many cases that will respond to the combination of the zinc ionization and the boric-iodin powder.

I have seen zinc ionization performed in the offices of some doctors and I wasn't surprised at all when they told me that they had obtained poor results. The chief reason for it is that they permit the technician to carry out the whole procedure.

You can't do it. The technician knows nothing about where to place the speculum. I have looked in a good many of these ears in which

the treatment was in operation and found the speculum up against the canal wall, instead of into the depth of the canal so that you could actually look down almost to the ear drum, Unless your solution gets down to the ear drum and through the drum into the middle ear, you are not going to obtain results.

Of course there are definite indications as described by Friel for the use of zinc ionization, but I believe that you cannot tell in which cases you could obtain good results with zinc ionization until you have actually tried it. In other words, the test is the therapeutic test.

**Dr. Ellis G. Linn** (Des Moines, Iowa): May I make one more suggestion as recalled by Dr. Hollender?

In using the Eustachian catheter for the purpose, if I am treating the left ear, I would have the ear down and pass the air through the catheter, because the moisture in the ear secretion in the middle ear lies not immediately in front of the opening but around and about and below it, and it will be partially forced through by the air stream passing through the perforations.

**Dr. Issac D. Walker** (Tonkawa, Oklahoma) Closing Discussion: I want to thank all the gentlemen for the generous discussion of my paper.

Of course, one usually varies his treatment according to information and experience, as I have done and others will do. Personally, I have tried blowing the air through the ear but I have imagined that sucking it out or pulling it through is better because it has a tendency to come to a point toward you, and when you are blowing it from you it has a tendency to scatter. I had an idea that perhaps in doing this we would be more apt to drive the pus into the mucous membrane space or down where you did not want it to go.

I have tried suction in almost all places. I have wound up by introducing suction through the auditory canal. I realize that some people do not do it that way, but my results have been sufficiently satisfactory to call your attention to it.

In regard to iodin powder, I have had some good results, apparently, but I have found cases where granulations apparently developed in the ear by using boric acid, that perhaps would not have occurred had one not used it.

I have used many different preparations for removing moisture from the canal. Most of them will dry up the canal to some extent but I discarded them because of the likelihood of formation of granulations in the ear. There is nothing in the whole realm of therapeutics that will stimulate granulations so quickly as boric acid.

If you will just remember that you will find out that you will have to destroy some form of obstruction that you wouldn't have if you didn't use powder.

I want to thank you very much. I am glad that Dr. Linn brought out the point about increasing and decreasing the current rate. I also do that but I did not say anything about it. It is a matter of necessity that you do not turn your current on full strength to start with. It should be decreased at the same rate.

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## The Progress of Physical Therapy

In the five years during which the special Committee on Physical Therapy has been in existence it has done a great deal to define the legal status of that specialty. The past two years have seen a marked decrease in the number of licenses issued to non-medical technicians. This is in all probability due to the educational requirements which are now in force. It is three years since any applications have been accepted for licensure under the waiver clause of the physiotherapy section of the Medical Practice Act.

The control of non-medical technicians is greatly facilitated by a regulation issued by the State Commissioner of Education last year which requires registered physiotherapists to have a written prescription from a physician for every case treated. This prescription must give the diagnosis and specify the type of therapy indicated. Observance of this rule will help materially to prevent the assumption of medical prerogatives by lay technicians.

The Committee has not limited itself to the legal aspects of physiotherapeutic practice. It has co-operated in a state-wide movement to offer free courses in physical therapy to general practitioners and has taken steps at various times against commercial schools. Its educational program includes practical measures to enable County Society members to employ physical therapy in compensation practice.

The Annual Report, published in this issue, gives an interesting picture of the successful emergence of physical therapy from the somewhat anomalous situation in which it was placed by the physiotherapy clause of the Medical Practice Act. Much of the credit for the progress made belongs with the County Society's Special Committee.—*N. Y. Med. Week.*

# ATELECTASIS — A POSTOPERATIVE INDICATION FOR DIATHERMY *

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The favorable results obtained from the treatment of a relatively few cases of post-operative pulmonary distress associated with a moderate degree of pulmonary edema, statis, atelectasis or post-operative pneumonia, according to one's preference in describing it, is the basis for this report.

Every Roentgenologist has had the experience of x-raying, on the second or third day following an operation, a chest which has been diagnosed pneumonia by the surgeon or his consulting internist, and the film shows both diaphragms high but only faint or hazy markings at the bases with loss of the sharp line of the diaphragm at its inner and outer angles as seen in the normal chest. This picture to the Roentgenologist is certainly not that of a definite penumonia, and it was not until Henderson[1] first described post-operative atelectasis that its true nature was realized.

The Roentgenologist usually reported pulmonary edema, but the surgeon and his internist much preferred the word pneumonia as it was not proper to allow the patient to die with a pulmonary edema lest it might be in some way connected with the operation, while pneumonia is, of course, something entirely different and over which they had little control.

Death from pneumonia associated with the shock following a fractured hip in an aged individual is also an experience which many clinicians have had. Such an incident is so common that for the past half century the cause of shock has been studied from many angles, but Henderson's work in accurately determining the character of the local pathology in the lung and its treatment by the administration of carbon dioxide, seems to have opened up a new appreciation of the whole field of non-hemorrhagic shock; and from the number of close observers who are now working on the subject, even more information may soon be disclosed.

When Stewart first treated the true infectious type of pneumonia, that is primary pneumonia, with such astonishing results it is strange that diathermy was not applied more universally to this so-called post-operative or shock type pneumonia. But such was not the case, at least its use in the post-operative type was not suggested to the writer until about two years ago when Dr. Sebastian Carnazzo of St. Joseph's Hospital insisted that a patient of his should have this treatment the day following a gall bladder operation. Since that time it has been used at every opportunity with immediate relief to the patient. Such is the opinion at least of clinicians who have had experience with the method. According to Henderson this condition at the base of the lungs, sometimes spoken of as acapnia, is due to a deficient aeration of the blood in general, as well as of this portion of the lung, and may be found after any type of operation or serious injury where shock is present.

In 1905, Henderson presented the hypothesis that acapnia which accompanies shock whether due to operation or accident, is a factor in the depression of vitality, especially in the function of the respiration and circulation. Later, Haldane presented his classic demonstration of the normal control of respiration by carbon dioxide. Henderson states:

"That where acapnia exists the chest remains in a position near that of expiration and that there is little tone left in the respiratory muscles and the lungs are to a great extent deflated. A later observation has shown that there is a marked decrease in the vital capacity of the lungs, particularly after operation in the upper part of the abdomen, and that the vital capacity may be reduced to one-third normal on the first day after operation and, further, that this condition is not the result of pain, as increased depth of breathing under inhalation of carbon dioxide often causes no pain in patients who without this inhalation exhibit acapnial breathing.

"The most recent and complete demonstration of the acapnial position of the thorax is afforded by the work of Muller, Overholt and Pender-

* Read at the Tenth Annual Meeting of the American Congress of Physical Therapy, Omaha, Nebraska, October 7th, 1931.

grass. They find that after operations in the upper part of the abdomen it is several days before the normal vital capacity returns. In roentgenograms they find the diaphragm is elevated toward the thorax, at first 4.8 cm. on the right side and 3.5 cm. on the left, above the preoperative position. There is also a narrowing of the intercostal spaces. These conditions are so common that Muller and his associates even consider them as 'normal post-operative manifestations.' Inhalation of carbon dioxide tends to relieve this and to increase the inflation of the lungs. Muller and his associates therefore define the continued deflation as due to pulmonary compression and hypo-ventilation. They show roentgenographically that the condition may last for many hours and in some degree even for days after operation. There could scarcely be a clearer demonstration of the acapnial position of the lungs and of the opportunity thus afforded for occlusion of some areas within them to develop. Then must follow the absorption of air, atelectasis and, finally, if pathogenic organisms are present, post-operative pneumonia.

"The deflation of the lungs is the result of the extreme depression of tonus in those muscles which normally keep the thorax expanded. This post-operative and acapnial atonic state applies, indeed, to all the muscles of the body. It affords an explanation not only of atelectasis but also of that depression of the circulation which is the most important feature of post-operative shock; a state characterized by gray cyanosis, shrunken cutaneous veins, absence of jugular pulsation and thready arteriad pulse."

In his conclusions Henderson states, "The casual sequence leading to surgical shock (apart from hemorrhage) and that leading through atelectasis to postoperative pneumonia are closely related. Both originate in acapnia, one through depression of the circulation, the other through depression of respiration. . . .

"After every major surgical operation there is not only a decrease in the volume of air breathed but also a prolonged loss of tonus and relaxation in the thoracic muscles and the diaphragm. The vital capacity of the thorax is thus greatly decreased; the lungs are correspondingly deflated, and occlusion of pulmonary airways readily develop. The air in the occluded lobules, lobe or lung is then absorbed, and atelectasis is produced. If pathogenic organisms are present they find in the unaerated, undrained area conditions which favor their growth, and pneumonia may result.

"Inhalation of carbon dioxide by counteracting acapnia and inducing deeper breathing inflates the lungs and prevents the development of atelectasis. It is thus a specific preventive of the postoperative pulmonary complications that lead to pneumonia."

From the above quotations the condition of atelectasis as it is found accompanying postoperative or traumatic shock seems to be well established, and the effect of the administration of carbon dioxide to increase the depth and frequency of the respiration is theoretically and practically correct. In the use of $CO_2$ we know the effect is due to the fact that it is a stimulant to respiration, but the exact reason for improvement following the use of diathermia is not clear to those observing these cases. If a deficient aeration due to a shallow respiratory excursion of the diaphragm is the cause for their improvement (Henderson and others agree that it is always present), it may be suggested that the heating of these muscles may act in the nature of an anti-spasmodic reflex, resulting in a deeper respiratory action and a rapid clearing up of the condition. One thing is certain, however, and that is the rapidity in the improvement of the depth of the respiration and sense of well being on the part of the patient. This appears invariably ten or fifteen minutes after the first treatment has began. The usual thing is for the patient to tell you that they feel so much better before the first treatment is completed, and shortly afterwards they usually enjoy a restful sleep. The treatment may be given for several days and is well tolerated. Observers of the work have been impressed with the idea that the patient rests easier, has less pain and has a shorter and more pleasant convalescence than cases undergoing similar operations but not so treated with diathermia. Many new improvements in surgery have been introduced since the writer's intern days. Improvements in surgical technic, surgical preparation, such as a liver function test, basal metabolic rate estimation, etc., have greatly aided the surgeon in his selection of patients as well as lessening the disagreeable and often fatal results. The postoperative treatment has also improved. The oxygen tent and administration of carbon dioxide has been strongly recommended by our colleagues, the internist, as a safeguard or preventative of postoperative pneumonia, but the use of the oxygen tent is extremely expensive as compared with

the cost of diathermia. However, we are not at this moment interested in a comparison of two apparently satisfactory methods of meeting or preventing a serious postoperative condition. Suffice it to say, that from the author's observation, the diathermia method of treatment is unhesitatingly recommended for those patients who have had an operation or an accident followed by shock and appear to be developing embarrassment in their respiration.

The work of Henderson and many others makes extremely interesting reading. His article includes a rather complete bibliography which should be of great help to anyone interested in the foregoing problem. The writer fully believes that when Henderson's work is more generally appreciated the treatment of acapnia will be a factor in reducing the mortality in cases undergoing major surgical operations as well as being a major factor in combating traumatic shock. Whether or not diathermia on an extensive trial will prove beneficial as it apparently has in our own small series of cases, and what its status will be as compared with the use of carbon dioxide in meeting this condition, remains to be proven by future studies. Any measure which may further lessen the suffering of the patient and at the same time further decrease the postoperative mortality is certainly welcome to all concerned.

The technic used is as follows: An electrode about four inches by five inches is placed along the axillary border on each side of the thorax at the base of the lung, is held in place against the chest by elastic bandages or by light sandbags, one on each side; the wires are clipped on, and from 900 to 1,400 milliamperes of current is used for twenty or thirty minutes.

## Conclusions

In concluding it seems to the writer that the condition of post-operative or post-traumatic acapnia with its resultant atelectasis should be more frequently recognized than seems at present to be the case. If according to Muller, Overholt and Pendergrass, it is true that acapnia or hypo ventilation of the lung is always present as a normal post-operative finding and may last for two or three days, it would appear to be good practice in all operative or seriously injured cases to routinely stimulate breathing during the first few days by any satisfactory method. By this procedure it seems that one would lessen the incidence of more serious complications which this condition of pulmonary hypo ventilation leads to, principally post-operative pneumonia. Carbon dioxide of course has its place established in the routine therapy of this condition. In this paper diathermia through the bases of the lungs, is also advocated because of the excellent results obtained by the use of this method.

## References

1. Henderson et al.: Symposium on Atelectasis and Pneumonia, *Journal of the American Medical Association.* July 13, 1929.

2. Henderson: Acapnia as a Factor in Post-operative Shock, Atelectasis and Pneumonia. *Journal of the American Medical Association.* August 23, 1930.

*(Discussion of this paper is included under the adjoining paper of Dr. H. C. Miller.)*

# ROUTINE POSTOPERATIVE USE OF PHYSICAL THERAPY IN GENERAL SURGERY *

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OMAHA, NEBRASKA

The surgical treatment of mankind's various ailments is divided into three parts: pre-operative, operative, and postoperative. I am not discounting careful diagnosis and pre-operative preparation, nor technical skill in operating, but I do say that these are useless unless the postoperative treatment is completely adequate. I made use of diathermy, infrared, and ultraviolet as an office procedure for a number of years before I learned how valuable they could be in immediate postoperative treatment. How I became interested in the application of physical agents to postoperative treatment is of less interest than my clinical experience would make too long a story with them, hence I shall begin with the operating room and tell you what I use, how I use it, and why. Inasmuch as the major portion of my work is abdominal and pelvic surgery, this paper will chiefly be concerned with that branch of surgery.

Beginning at the operating room, as the skin wound is being sutured the anesthetist administers 8 per cent carbon dioxid in oxygen to the patient for the terminal five minutes (this if the anesthetic has been of the general inhalation type). This is repeated twice daily for three days. The purpose is to prevent the so-called inhalation, or ether pneumonia. Carbon dioxid, as you know, is a great stimulant to the rate and extent of the respiratory excursions. Respiration stimulated in this manner to its fullest extent loosens the mucus plugs that obstruct the bronchioles. These obstructing mucus plugs cause a circumscribed atalectasis, and finally, if not relieved, a lobular pneumonia.

The wound dressing is a moderately thin gauze pack held by adhesive straps. Special care is observed in seeing that the strap across the abdomen between the lower border of the ribs and the crest of the ilium is not constricting. A tight strap here will compress the abdominal viscera and retard, if not completely stop, peristalsis. The dressing is thin so that the wound may be thoroughly chilled by the ice cap that is applied at once when the patient reaches his room, and is continued for forty-eight hours. This serves two purposes: first, the cold is anesthetic in quality, it moderates the pain in the wound; and lastly it prevents the congestion and swelling of the wound, and thus prevents too great a tension upon the cutaneous and subcutaneous sutures. An ice cap over too thick a dressing is useless.

At the end of forty-eight hours the patient is taken in bed to the physiotherapy department where he is disrobed, the straps of the abdominal dressing cut on one side and the dressing turned aside. He is then given a general radiation with infrared light for thirty minutes, the point of intensity of this light being focused upon the wound. Following this the ultraviolet is applied for two minutes to each quarter of the body. The length of irradiation is increased one minute each day. Both treatments are given once daily from the second post-operative day until the patient is discharged.

My standing orders at the hospital directs the giving of morphine sulphate, grains one-sixth, as often as is necessary to keep the patient comfortable for the first twenty-four hours and not beyond that time. While morphine is undoubtedly the great pain reliever, it has one action that is harmful. It causes a stasis of the intestines. If during the second twenty-four hours the patient complains of abdominal pains the infrared treatment is started at once.

The effect of the infrared on the tense, distended, tender abdomen is spectacular. I have seen patients fairly writhing with pain go to sleep before the thirty minute treatment has been completed. Having had such splendid results with postoperative ileus convinced me that if infrared would relieve, it would prevent ileus, and it does.

* Read at the Tenth Annual Meeting of the American Congress of Physical Therapy, Omaha, Nebraska, October 7th, 1931.

Naturally, if some mechanical obstruction is present, it will not be effective, and additional surgery is then indicated.

At the time this paper was written I had a patient at one of the local hospitals who fell and sustained a compression fracture of the fourth lumbar vertebra. His condition was complicated with a paralytic ileus, distention and great pain. Morphine relieved his back pain, but by stopping peristalsis increased the ileus. Enemas and pituitrin were not effective until infrared light was applied to his abdomen. This relieved him in two days.

How infrared light produces this effect upon the static post-operative intestine may be explained not only on the basis of its penetration, but also on the production of heat in the tissues, and the dilatation of the blood vessels bringing a greatly increased supply of fresh arterial blood to the part. I think it may also be explained on the basis of reflex action. The nerves arising from the spinal cord supplying the abdominal skin have also sympathetic branches which supply the abdominal viscera. Inflammatory conditions within the abdomen cause increased sensitivity to corresponding skin areas. For instance, in case of an acutely inflammed appendix one will find by scratching the skin with a pin that there is a band of increased sensitivity on the affected side. About a year ago I read an article (the author's name I regret to say I have forgotten), which explained how the author had discovered skin areas of increased sensitivity associated with pain in both the thorax and abdomen, and how he had relieved the visceral pain by injecting these areas with novocaine. I think that the soothing action of the infrared ray upon the nerves supplying the abdominal skin reflexly causes a relaxation of tension within the abdomen through the spinal sympathetic enervations. This, of course, is speculative, but I believe it explains the action of infrared upon the static bowel.

Abdomino-pelvic operative cases having routine postoperative infrared treatment very seldom have the common complication of retention of urine.

Ultraviolet radiation is given for its general tonic effect, as well as antiseptic and stimulating effect upon the wound itself. I find it perfectly feasible to remove the skin sutures on the fifth postoperative day. Infrared and ultraviolet light have stimulated the healing process and the wound is perfectly sealed.

If postoperative pneumonia developes (and let me say in passing, I have had no pneumonia since I began using carbon dioxid and oxygen as a routine) then diathermy is, I believe, a most effective treatment. If it is localized, the electrodes are applied so that the current will pass directly through the affected area. If it is a general bronchitis, the electrodes are applied to each side of the chest from the axilla to the rib border. The dosage is not measured as to milliamperes. It is given to the point of tolerance of the patient for thirty minutes to one hour, and repeated twice daily until complete relief is obtained. I have seen one treatment give complete relief.

All operative cases, regardless of the site of the treatment, are given infrared and ultraviolet radiation. If acute gastric distress occurs, then lavage followed by diathermy through the stomach usually relieves the patient in one treatment. The same routine previously indicated is used on all caesarians, and the baby is given ultraviolet daily.

In traumatic surgery, infrared and diathermy are extremely valuable. For strains and contusions there is nothing that so effectively reduces the swelling as infrared. If there are abrasions, lacerations or infected wounds the ultraviolet light is applied also. I find the application of ultraviolet and infrared especially effective in streptococcic infections, especially those streptococcic infections that have invaded the lymphatics, the so-called blood poisonings.

In fractures, simple or compound, operative or non-operative, infrared and ultraviolet is applied until the swelling has reduced sufficiently to permit immobilization in casts, etc. Passive motion and infrared are started as soon as is possible in all fracture cases where a joint has been immobilized. If the joints are not sufficiently mobile after the removal of immobilizing splints, traction, etc., diathermy is the treatment of choice.

## Conclusions

To recapitulate, I find that the using of physiotherapy gives patients relief from the greater part of the usual postoperative discomfort, that they rest better, heal more quickly, gain strength more rapidly, and as a consequence of all this, are enabled to leave the hospital earlier. On comparing records, I find that my patients are spending approximately three and one-half days less in the hospital than they did before I used physiotherapy as a routine postoperative treatment.

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## Discussions of Drs. Kelly and Miller Papers

**Dr. N. H. Polmer** (New Orleans, La.): Unfortunately, the postoperative use of physical therapy is far from routine at most institutions and with most surgeons. With the exception of the after-treatment of fractures, of arthroplasties, and of nerve sutures, my experience with the postoperative use of physical therapy has been chiefly in those cases where postoperative complications had already developed or were imminent.

Therefore, instead of bringing the patient to the physical therapy department, we bring the physical therapy department to the postoperative patient. We have a dozen infrared lamps which are available for use at the patient's bedside, together with portable high frequency and ultraviolet equipment.

Our surgeons are realizing the value of infrared and radiant light and heat in the treatment and prevention of postoperative abdominal distention. Hot water bottles, hot turpentine stupes and hot fomentations have been more or less effectively used for a number of years, but infrared radiation possesses the increased advantage that no added weight is placed upon the patient's abdomen, and should the attending surgeon desire turpentine stupes, or hot fomentations, these can be kept hot with an infrared generator, thereby preventing the patient from being disturbed by too frequent changing of the hot dressings. We drape a large bath towel about the infrared lamp and focus it over the abdomen at a distance of about twenty-four inches for thirty minutes. The lamp remains in the patient's bedroom, and the exposures are repeated in from thirty minutes to several hours, as indicated.

Kellogg tells us that heat owes its value as a pain relieving agent to its inhibitory action. It produces pain inhibition by acting on the temperature nerves. Heat lessens the functional activity of an over-active organ, and for that reason is a great aid in overcoming colic and intestinal spasm.

I should like to briefly relate the history of a case. Mr. T. McD., patient of Dr. Russel E. Stone who was admitted a 2 a. m., March 15, 1931, with a diagnosis of "Acute Intestinal Obstruction." Examination on admission revealed "a hard mass to the right of the midline, about the level of the anterior superior ileac spine. The mass is tender and painful to palpation."

He was given hot stupes, an oil and glycerine enema, and finally morphine sulphate, one-quarter grain, by hypodermic, at 4 a. m., with little relief.

At 7 a. m., he was given a flush, and infrared radiation, together with continuous stuping, as per order by the attending surgeon.

The bedside notes copied from the chart read: "Infrared was started at 7 o'clock. Ten a. m. flush returned slightly discolored. Three p. m. flush returned highly discolored, some flatus, and a small amount of fecal matter. Eight p. m. bowels moved, a moderate amount of liquid stool, expelled a great deal of gas. Has not complained of any discomfort this p. m. Hot stuping continuously, 7 a. m. to 6:30 p. m., with infrared radiation to abdomen, thirty minutes on and thirty minutes off.

"This patient made an uneventful recovery. He had soft diet thirty-six hours after admission and was discharged four and one-half days after admission."

We also have been using diathermy in postoperative pneumonia on several occasions and have used it likewise in the treatment of beginning pneumonia, particularly in the middle-aged, bed-ridden fracture cases.

We have had a limited experience in the use of diathermy in the treatment of postoperative shock and subnormal temperature following a few cases of upper right quadrant surgery, but we have not been called upon to use it for the prevention of these conditions during the operation as was recommended by Crile and Portman. We have used general ultraviolet radiation in toning up poor operative risks, but, likewise, our experience has not been as we should like; that is, routine.

In our opinion physical therapy has a definite place in the after-care of many surgical cases. Recent statistics compiled at our institution show that even when no physical therapy was used, the average hospital residence of postoperative cases has been reduced by several or more days during the past five or ten years. This has been attributed in part to earlier and better diagnosis, better surgery and better postoperative care. In this better postoperative care it is not at all unlikely that routine use of physical agents and physical therapy will further reduce the convalescence of surgical patients.

**Dr. W. L. Ross** (Omaha, Nebr.): I am very much impressed with Dr. Kelly's paper. It is to that phase of the discussion I want to refer, but more particularly emphasize the general tonic or stimulating effect that diathermy will have, especially on the heart. If the temperature is low, it will bring your temperature up to normal. No

matter where you have the electrodes on the body, you will get the same effect, so that in applying the electrodes on either side or over the abdomen and the back, or anywhere, do not forget you have one of the very best heart tonics, one of the very best nerve tonics known to the profession. I want to stress this fact and emphasize that in cases of shock or related symptoms, you can demonstrate the rise of temperature by introducing a thermometer under the patient's tongue.

**Dr. L. B. Joslyn** (Maywood, Ill.): I have always been a believer in the use of these physical agents postoperatively. I just want to bring out one point in relation to eye surgery. We have had occasion to use diathermy following nucleation of cataracts, with what we consider remarkable results, the patient being able to really distinguish fingers in a very short space of time. The remnants of the capsule seem to absorb very rapidly by use of diathermy for these enucleations, according to our special technic. In the case of mastoidectomies, we use infrared, not continuously but several times a day, with what we believe is extremely beneficial results.

**Dr. Luther A. Tarbell** (New Haven, Conn.): I have listened with keen interest to both essayists, Dr. Kelly and Dr. Miller. Having treated about 600 patients with diathermy in pneumonia and something over 100 postoperative cases, having also used the oxygen tent in a great many cases, I am naturally interested in the experiences of others in like conditions.

In going back into the history of oxygen work, I was very much interested in studying the work which has been done at the Rockefeller Institute where I believe a great deal more time and money has been spent in studying this particular phase of therapy than by any other individual or group. Dr. Briner and others have very carefully studied the effects of carbon dioxide in the respiratory quotient and its effect on the condition of the patient. In building their oxygen chamber they pass the air in such a manner as to have it circulate and receive the oxygen. They take all carbon dioxide out of the air, feeling that this produces the greatest result in the case of pneumonia. The particular oxygen tent which I use is the Roth-Barrack apparatus. It has that same particular attachment.

I want to congratulate Dr. Miller for his work in preventive medicine along this line. I think our real physicians of the future, who are to be our leaders, are to do the things for their patients which will be the utmost of prevention rather than trying to cure conditions which have already occurred, not only surgically and medically but in all other ways.

I want to endorse the technic of Dr. Kelly which I think is more efficient. Rather than using an electrode of a certain size and putting it down, trying to localize the area and have it over a special area, I think the idea of putting a large electrode along both sides, without disturbing the patient, is excellent. If localized, I think your plate should always be large enough, as in any pneumonia, to include the heart muscle. I am very sure that by following the methods as suggested by these gentlemen we can do a great deal for our postoperative cases.

**Dr. James F. Kelly** (Omaha, Nebr.): closing discussion: The point Dr. Tarbell brought up in connection with the excessive amount of $CO_2$ already present in pneumonia is well taken. I did not care to go into the relative merits of $CO_2$ and oxygen as I do not have anything to do with that work, although it has been used in similar conditions in which we have recommended the diathermia. In other words, the physical therapist and the internist are both trying to get to the patient at the same time. I am advocating the use of diathermia. We have had very excellent results with it.

Dr. Miller said that he gave his patients more treatment than I give mine. That is simple to explain: His patients are his and I am just an outsider. The surgeons put up with my work as short as possible and my results must always be bullseye shots, else my method is severely criticized.

In closing, as far as this paper of mine is concerned, I just want to present two things. One is this condition of hypoventilation at the base of the lungs following operation. That is an everyday clinical condition which I believe the surgeon should appreciate more than he does. I believe if he did appreciate what a little diathermy would do for his patients he would at least permit its trial for a few days. That is the thing I want to bring to your attention. Diathermy as I presented it today was not in the treatment of pneumonia, but was a preventive of pneumonia.

Dr. Tarbell's point of localizing electrodes when you have pneumonia is fine, but the condition I brought up today and spoke of is that of hypoventilation where you have the high diaphragm, and can demonstrate under x-ray pictures a basal edema. Diathermy in these patients is highly beneficial.

**Dr. H. C. Miller** (Omaha, Nebr.): I realize the time is short, so I will only take time to thank the gentlemen who discussed my paper, and to say again that I think the surgeon who overlooks infrared, ultraviolet and diathermy in routine postoperative cases is overlooking a very good opportunity.

# ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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# E D I T O R I A L S

## GALVANIC IONIZATION IN CHRONIC RHINITIS

The Rhinologist welcomes any practical suggestions for the relief of intermittent nasal obstruction because surgery so frequently fails to relieve this annoying symptom. The chief etiological factor, locally at least, is a turgescence of the nasal mucosa, especially over the inferior turbinals. There is also thickening of the mucous membrane over the septum. Generally, numerous factors may be at fault. Prominent among these are poor hygienic conditions, overeating and lack of adequate bodily exercise. The presence of sinus infections sometimes adds to the extent of the local pathology. Some writers contend that a true hypertrophy of the tissue does not develop, while others speak of the intumescense and hypertrophy and actually label the affection hypertrophic rhinitis.

The customary conservative procedures are at best only palliative. Some good results have been secured by cauterization of the inferior turbinals. For this purpose the galvanic cautery is employed. The use of the electric cautery is recommended by Ingersoll.[1] He condemns acid cauterization because of the impossibility of controlling its action. When the fused bead is employed, it may drop off and do much damage to the normal tissue.

According to Ingersoll, when cauterization is effected, contraction of the scar tissue decreases the swelling in the hypertrophied mucous membrane. The object of the procedure is to provide better breathing space by means of this contraction, with the destruction of as little tissue as possible.

Practically no destruction of tissue occurs when zinc ionization is employed. This method is far superior to cauterization and can be carried out without anesthesia. It is a harmless procedure which merits a trial before resorting to more drastic methods. Several specialists have recently called attention to the use of zinc ionization in nasal treatment and all are agreed as to its beneficial action.

In 1926, Hollender and Cottle,[2] writing on the treatment of nasal accessory sinus disease, described the indications for nasal zinc ionization. The authors suggested also that zinc ionization may prove advantageous in chronic sinuses such as the antrum, if the opening into it is large enough to permit a good approach. They concluded at that time that galvanic ionization has not been accorded the opportunity which it should have had in intranasal therapy and predicted that when its true value was recognized it would be adopted more generally by rhinologists.

Since this report was published, several others have appeared in the literature. Harris[3] believes that zinc ionization of the mucous membrane of the nose is a method of treatment which recommends itself for selected cases. Hollender[4] states that in simple chronic rhinitis and in less advanced cases of hypertrophic rhinitis, zinc ionization has been found to be an effective remedial measure. Both Harris and Hollender describe their technics which in many respects are similar. Their conclusions, too, are practically the same and they agree that the method is far from a "cure-all" and should be applied only in selected cases.

Recently Sputh[5] and McCurdy[6] have recorded their experiences with zinc ionization in rhinology. Their results correspond with those of the earlier workers on the subject.

In view of the uniform successes with the ionization method in chronic rhinitis, its more general adoption is definitely warranted. It is unfortunate that many rhinologists are not yet equipped to apply the various electrical currents in their practice. They prefer to cling to the older procedures, some of which are not only more complicated, but less productive of favorable end results.

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## A SEMINAR IN PHYSICAL THERAPY

Interest in physical therapy is continuing to grow. The profession now realizes that many disease conditions may be helped by the application of physical therapeutic procedures, alone or in conjunction with other remedial measures. Many favorable reports regarding its value have appeared in recent medical literature. There are many physicians who would like to learn more about the subject and about its technique. Physical therapy is a large subject and even those men who are limiting their practice to it do not possess all the information concerning it. An intimate knowledge of the subject requires a knowledge of physics, with particular reference to electricity, of hydrotherapy, gymnastics, corrective exercise and massage, as well as a knowledge of electrotherapy, radiation therapy including information concerning the medical value of ultraviolet, visible light, infra-red and Hertzian wave radiations. It is generally recognized that educational sources of information on this subject are too few. Those that have existed in the past have been in the main subsidized by manufacturers of apparatus. These lecturers have naturally been influenced by their commercial associations. Their presentations have generally been criticised as insufficient to convey any real knowledge of the subject. The statements made by them are said to have been characterized more by gleaming generalities and optimistic imageries, rather than by the facts based upon actual experience. This lack of educational facilities has been a severe handicap to the practitioner who desired to obtain the real facts regarding physical therapy.

The New York Physical Therapy Society, composed of practitioners of medicine who are particularly or exclusively interested in the practice of physical therapy, recognized that postgraduate educational facilities in the subject should be made available to the doctors practicing in and about New York City who desire to secure information concerning

physical therapy. Accordingly, a Seminar was arranged with sessions held at weekly intervals. Because it was felt that the latter part of the afternoon was the time most generally available, the lectures were given between the hours of 3:30 to 5:00 p. m. It was thought that most medical men would be too much occupied with the evening activities (social, medical societies, etc.) to permit their taking additional evenings for these lectures.

In order that the members of the society might not be accused of seeking special medical publicity for themselves, it was decided that none of the lectures were to be presented by members of the society residing in New York City. This made it necessary for us to seek such lecturers amongst the men of nearby cities who had done special work in physical therapy. It was considered best to present the various phases of physical therapy not by one man but by a group, each one of whom would talk on that particular division of the subject in which he was especially interested. Those men were invited to lecture who, in the opinion of the arranging committee, would be able to give an exact scientific presentation of their work with careful clinical evaluation of the results obtained. We deemed it essential to avoid the overly optimistic generalizations so commonly made in "physical therapy courses." Three of the twenty lecturers were members of the Council of Physical Therapy of the American Medical Association and one the former secretary of the Council. It was agreed that in order to develop an appreciation of the fundamentals of physical therapy, it was necessary to stress the physics of the procedures employed.

The order in which the lectures were arranged was by no means ideal. Our own society meetings are held the first Wednesday evening of each month and it was thought best, in order to economize on time, to fit these evenings into the general seminar scheme. For this reason every fourth lecture was held on a Wednesday evening instead of on Wednesday afternoon. This necessity for fitting the society meetings into the seminar as well as the difficulty in securing the services of the lecturers except at times agreeable to them made it necessary to deviate from that which we would have considered the best arrangement.

It was felt that these didactic presentations alone were insufficient for even an elementary presentation of the subject. It was necessary to offer clinical material and to show the details of the application of the technique of various physical therapy procedures to patients. For this purpose those members of the society who were in charge of well equipped departments of physical therapy in the leading city hospitals volunteered their cooperation and opened their departments to the matriculates of the seminar. The chiefs of these departments indicated the particular time in which the matriculates were specially invited to witness the physical therapy procedures employed.

In all, there were seventeen lecture sessions, at which twenty addresses were given by as many lecturers. Presented at weekly intervals, the seminar extended over a period of four months. It was realized that it was best to condense the period of time required as much as possible. It was felt, however, that even though this was an elementary educational effort it was essential to include all the material contained in the program. For a more comprehensive presentation it would be necessary to utilize much more time and to discuss the various considerations in much greater detail. The student would also find it necessary to spend a far greater amount of time working in a department of physical therapy. These facts may be of special interest to those medical educators who think that the subject of physical therapy may be thoroughly presented in possibly ten or twelve hours. It would, of course, be possible to shorten the entire period of time during which this Seminar was given by holding the lectures and demonstrations at more frequent intervals.

The charge of $25.00 was made for the entire seminar, which included both the didactic lectures and the clinical demonstrations. This charge was made in order to defray the cost of conducting the seminar:—the necessary printing, mailing expenses, railroad fares of lecturers, etc. No one of the lecturers or of those giving the clinical demonstrations received any compensation. A great amount of time and effort was given gratuitously by the secretary of the society.

Various medical journals printed the program of the seminar. For example, the New York County Medical Society's official organ, *New York Medical Week* called attention to

the various lectures weekly in the section "lectures in prospect."

The character of the lecturers and the care with which they prepared their subjects accounted for the great enthusiasm felt by those who attended the seminar. The expression was often heard at the end of one lecture or of another that this one alone was worth the fee charged for the entire seminar.

The results of this undertaking have clearly demonstrated that there does exist a need for postgraduate physical therapy education amongst the practitioners of New York City. We suppose that a similar need exists in other sections of this country.

WM. BIERMAN, M.D., President,
*New York Physical Therapy Society.*

EDITORIAL NOTE—In order that these lectures may enjoy a wider reading audience, they will be published as symposium groups in future issues of this JOURNAL. The high quality of these discussions assures our readers of the most progressive thoughts on the subject.

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## Report of the New York Special Committee on Physical Therapy for 1931

The past year marks the fifth year of the activities of your Committee. As in previous years, they have been directed toward (1) co-operation with State and City authorities in the observation of the legal statutes; (2) co-operation and surveillance in educational activities, including those of physical therapy personnel, and fostering some activities of its own. (3) To these two main lines of endeavor was added during the past year the effort to carry out the provisions of the agreement with the insurance carriers regarding physical therapy in compensation work. Your Committee closely co-operated with the Committee on Physical Therapy of the State Society which was created after it was found, in carrying on your Committee's work, that most of the problems called for state wide approach and solution.

1. *Observance of Law.* Reviewing the working of the physiotherapy clause in the Medical Practice Act during the past five years, the somewhat chaotic situation created by this Act has settled down to one of more definite status and regulation. As is well known, the number of non-medical physiotherapists licensed to practice exceeded four times the 75 to 100 originally estimated by Commissioner Downing. It amounted to 397 on June 1, 1931, of which 176 are in Manhattan and the Bronx, 76 in Brooklyn, 30 in Queens, 109 in other localities of New York State, and 6 outside of the State. Only the waiver clause of the licensing Act can explain such as excess over the original estimate and, as one of the contributory causes, it must be known that a large number—about 80—of licenses was due to legal proceedings against the State Department of Education by the pupils of one commercial school which has since gone out of existence. No applications for licensure under the waiver clause have been accepted since February, 1929, and since the observance of the final requirements for licensing, *i. e.*, four years of study under recognized auspices and the passing of examination, the number of licenses issued has decreased considerably. During 1930 and up to June, 1931, they amounted to only 35 as compared with the total of 362 issued from 1926 to 1929.

A regulation by the Commissioner of Education was issued during the past year, requiring that "registered physiotherapists shall keep a written prescription signed by a licensed physician for each patient given physiotherapeutic treatment; that prescription shall state diagnosis and the type of treatment ordered. Such records shall be open to the inspection of the Department of Education at all times." So far as this Committee knows, no regulations for the revocation of licenses in case of fraud or malpractice have been issued as yet.

Evidently due to a better observance of the legal provisions, the number of complaints received by your Committee during the past year was less than ever before. Of those received, most were in regard to the illegal use of the name "institute" by a person licensed to practice only as an individual. The State Department of Education was unable to suppress such violation in those instances where, according to the present Sanitary Code of New York City, a license for a massage institute had been given to the same individual. After consulting with the Department of Legal Medicine of the City of New York, this Committee fully three years ago proposed suitable amendments of the Sanitary Code in reference to the licensing of massage operators, and these amendments were transmitted with the endorsement of the Society, to the

Commissioner of Health. Unfortunately, final action on this matter is still being delayed by the city authorities, and thus the conflict with the State Educational law still continues.

It is hoped that with more and more physicians and hospital clinics taking to the actual practice of physical measures, and under the present depression, the great majority of the registered physiotherapists will give up the economic folly of maintaining an independent establishment and operate in doctors' offices and in hospitals, where the principal sphere of usefulness of well trained technical personnel exists.

2. *Educational Work.* Your Committee co-operated with the State Committee on Physical Therapy in a statewide effort to offer, free of charge, to general practitioners, clinical demonstrations on physical therapy at teaching clinics and hospitals with suitable departments. Your Committee is considering plans to sponsor post-graduate training of physicians in physical therapy in traumatic conditions in connection with the compensation agreement.

The Committee is investigating the status of some recently organized training schools of physiotherapy technicians and massage operators. It holds that training courses for technical personnel are best given by ethical physicians of proper qualifications, in hospitals or other non-commercial teaching institutes. The Committee reminds the members of the Society that the adoption of its Annual Report in 1927 sanctioned the recommendations "that it is considered unethical for members of the County Medical Society to connect themselves in any way with commercial schools of physical therapy not approved by the Society."

3. *Compensation Work.* The Society being pledged to carry out the requirements of the agreement with the insurance carries, your Committee endeavored to develop and establish standards for equipment and training in physical therapy, under this agreement. The Committee received the assurance of the carriers that the carrying on of physical therapy by general practitioners in compensation cases will be welcomed, and that questions as to the propriety of treatment and charges will be subject to arbitration. With the approval of the Comitia Minora, a request was published in the official organ of the Society that all members desirous of carrying on physical therapy under the agreement register with the Committee and in doing so state their experience and training. A minimum standard of equipment and of keeping records was decided upon and with the additional training opportunities offered it is hoped that a more efficient use of physical measures in compensation work will follow.

Your Chairman wishes to thank the Secretary of the State Board of Medical Examiners, the Director of the Division of Legal Medicine of the City Health Department, and the Director of the Society for their ever ready co-operation and advice—the executive staff of the Society for their unfailing courtesy and help in technical details, and, finally, the members of the Committee for their interest and faithful work.

Respectfully submitted,

RICHARD KOVACS, Chairman.

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### American Society for Cancer Control

States that "In the opinion of the Board the only effective treatments for cancer today are surgery or irradiation with x-rays or radium. It further desires to emphasize the point that the best palliative or permanent results are to be obtained when the treatments are applied as soon as possible after the first warning symptoms.

"The Board also wishes to make this statement to the public: If people wish the greatest possible protection against cancer and other disease they should, while they are well, select a family physician if they can afford it, or a clinic while they are well and should ask not only for an examination but for advice on the rules of health and on the earliest symptoms of disease."

# NEW PYREX GLASS TONGUE DEPRESSOR AND PILLAR RETRACTOR IN ELECTROCOAGULATION OF TONSILS

NATHAN A. GOLDSTEIN, M.D.

BROOKLYN, N. Y.

In electrocoagulation of tonsils, as in surgical removal, a tongue depressor and pillar retractor are used. It is advisable in the electrocoagulation that these instruments be nonconductors of electricity, and because these instruments are used in the patient's mouth I feel that they should be sterilized by boiling.

The instruments now in use have been made of hard rubber, celluloid, casein products, etc., but these materials cannot be sterilized by boiling. I have therefore devised a pillar retractor and tongue depressor which have been made by the Corning Glass Works, of Pyrex glass. These instruments can be boiled.

The shape of the pillar retractor is similar to the Hurd pillar retractor. The shape of the blade of the tongue depressor was taken from Dr. Bierman's use of a celluloid shoehorn. This, as you notice, was made narrower, and has a handle at right angles.

New Pyrex Tongue Depressor and Pillar Retractor for Electrocoagulation of Tonsils.

I have used these instruments and find them very satisfactory.

# QUERIES AND CLINICAL NOTES

**A. What advantage is electrocoagulation in prolapsed urethra?**

A query has been presented regarding a female patient suffering from prolapsed urethra, and the question raised regarding the usefulness of electrocoagulation in this case. The physician argues, on theoretical grounds, that the healing effect from such a procedure may induce sufficient fibrosis to shrink and fix the urethra in a better position. The problem is altogether an unusual one, and we hesitate to advance any opinion in regard to the after-effect of such an operation. We are inclined to adopt a conservative attitude, feeling that the tissues would not respond in the manner hoped for by the physician. We also are hesitant in accepting the diagnosis layed down by the physician suspecting that the factors in back of the pathology have not altogether been reasonably emphasized. However, if the situation is such as the physician has described it, physical therapy has as little to offer in this instance as any of the other branches in therapeutics. Perhaps the commentator is not sufficiently oriented in the problem and he therefore throws it open for general discussion. Suggestions are therefore solicited from all the readers.

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**In Prostatitis, has physical therapy any advantage over prostatic massage?**

It has heretofore been accepted as orthodox procedure that prostatic massage is the most important type of treatment of gonorrheal prostatitis after the acute symptoms have run their course. In the acute stage, rest, heat and sedatives have been the first line of defense. In the subacute and chronic stage, digital massage has been the method advocated by urologists. In 1926, Stutzin took a contraposition regarding the efficacy of digital massage, arguing that the anatomico structure of the prostate consisted of straight tubulo-alveolar glands and hence massage pressed in the diseased secretion, rather than facilitating its excretion. More recently, von Heiner, of the Dermatologic clinic, at Szeged, (Dermatologische Wocheschrift No. 16, 1931), studied a series of 116 cases, of prostatitis divided so that 58 received digital treatment and the remaining 58 received diathermy and faradization. From his observations, "the cases treated without massage, needed on the average, a much longer time for cure, and that, in these cases, complications and relapses were also much more frequent." A more optimistic note is sounded by Pedersen ("Electrotherapeutics in Urology." *Am. Jour. Electrotherap. and Rad.*, Aug., 1925), who states that the best results may be expected from static electricity and its powerful mechanic massage effects. According to Kovacs (Electrotherapy and Light Therapy, p. 458), "Diathermy serves as a standby for relief of pain and improvement of circulation; the addition of a mechanical measure for drainage and removal of infiltration is indicated." Kovacs feels that the application of the static wave current to a chronic congested prostate is one of the most potent physical measures available, and its effect is far superior to digital massage.

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**The Electric Pad in Chronic Nephritis**

Grosschopff states (*Fortschritte der Therapie*, August 25, 1931) that he has had remarkable results in treating two cases of apparently hopeless kidney disease with an electrically heated pad. The pad is worn both day and night, and is carefully applied, so as not to heat the anterior abdomen or the spinal cord. When this precaution is taken the pads are well borne by the patient.

As stated, two cases of advanced kidney disease were brought to a condition where according to every test the health was normal.

# CURRENT NEWS AND SCIENCE

### Growth-Promoting Vitamin Isolated by British Worker

Vitamin A, the growth-promoting vitamin found in liver, cod liver oil, butter fat, egg yolk, and green and yellow vegetables, has just been isolated by Prof. J. C. Drummond, professor of biochemistry in University College, University of London, in association with Prof. I. M. Heilbron and Dr. R. A. Morton of Liverpool University.

In their report to the Society of Chemical Industry these scientists tell how they obtain the very elusive vitamin A by splitting carotene into two products. Carotene is the pigment which gives the yellow color to carrots, yellow corn, butter and egg yolk. One of the two products obtained by splitting carotene is vitamin A, they believe. They describe it as an alcohol and state that it contains no nitrogen and has a potency about equal to that of the newly discovered crystals of vitamin D.

At the same time these investigators reported that they have obtained from halibut liver oil a sticky, yellowish oil which is nine-tenths pure vitamin A.—*Science News Letter*, January 16, 1932.

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### Columbia University Offers Resident Service in Physical Therapy

A splendid opportunity is presented to the practitioner who desires to obtain special experience in physical therapy. A residence service in physical therapy has been offered by Columbia University which extends for three months. Anyone so fortunate as to be accepted for this service will find the widest opportunities for broadest orientation in the subject. The service is under Dr. Norman Titus, director and head of the department of physical therapy at the New York Medical Center and the Presbyterian Hospital. This resident service is a resident fellow at Columbia, residing in the Presbyterian Hospital. The cost is $100.00 a month which hardly covers the maintenance, such as board and room, laundry, etc. We highly endorse this residency and urge that the applicants write in early for appointments. The residency is limited to one every three months.

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### Columbia University Offers Post-Graduate Course in Physical Therapy

Columbia University announces a six weeks' post-graduate course in physical therapy for qualified graduates in medicine, to begin March 15, 1932. The course will consist of two weeks of lectures and laboratory demonstrations, two weeks of demonstrations and practice of technique and two weeks of actual clinical experience in treating patients at the Vanderbilt Clinic, Presbyterian, Fifth Avenue, Beth Israel, Beekman Street and Reconstruction Hospitals. The faculty of instruction in physical therapy will consist of myself, C. L. deVictoria, Randolph Raynolds, M. C. L. McGuinness, Charles R. Brooke, Robert Muller, Wm. B. Snow, Jr., Harold M. Herring and William Bierman. This course will be limited to twelve members and will not be given unless eight apply. Another course will be given probably about June 1st and the course will be repeated throughout the year as frequently as practical.

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### Camera and X-Rays Used to Locate Ulcers in Stomach

A combination of x-rays and a tiny camera which is lowered into the stomach now gives the physician or surgeon a means of determining more exactly the location of ulcers or other lesions in the stomach, Dr. P. E. Thal of Chicago told members of the Radiological Society of North America.

The camera consists really of two cameras, one above and one below an illuminating bulb, Dr. Thal explained. The whole arrangement is small enough to be passed into the stomach easily. A flexible tube from the camera carries the manipulating mechanism. Each camera has four film chambers arranged so that tiny photographs are made of four sides of the stomach walls. Thus eight pictures may be made at one time, covering the entire interior area.

By means of the x-ray, the physician can

see the camera in the stomach and guide it to the best place to take the pictures. When all is ready, the exposure is made by opening the shutter and flashing the light. The picture tells the surgeon just where he may expect to find the ulcer he wishes to remove. — *Science News Letter,* December 5, 1931.

### Tracks of Cosmic Rays Seen by Experimenters

The cosmic rays, piercing radiations from the distant heavens, have been seen. At least, the straight paths along which they travel were made visible in experiments reported to the American Physical Society at Minneapolis by Dr. L. M. Mott-Smith and G. L. Locher of the Rice Institute, Texas.

Bullet-like corpuscles must form the problematical cosmic rays, conclude these investigators, from their observations of these thin straight tracks of rapidly moving particles.

The famous Wilson cloud expansion chamber, which has been used to spy even on colliding atoms, was used by Dr. Mott-Smith and Mr. Locher in these experiments to make visible the paths of the rays. In a strong light they appear as trains of water droplets.

Simultaneously with the formation of each bullet-track a signal was observed in an electroscopic instrument known as a Geiger-Müller counter, used to detect the arrival of these messengers from the depths of space.

Only a fast material particle like an electron could score such double hits, says the experimenters. They are "non-material" waves like the gamma rays from radium, however, in the opinion of Dr. R. A. Millikan, leading American investigator of the cosmic rays.

Supporters of the wave theory of the rays believe that their particle-like behavior is not due to the direct action of the rays but to secondary electrons driven out of air atoms encountered by the rays. — *Science News Letter,* December 12, 1931.

According to *The Modern Hospital,* artificial sunburn may replace tags and footprints as a means of identifying newly-born babes at the Shore Road Hospital, Brooklyn, if recent experiments prove successful.

The new method, experiments in which were made recently, consists of branding new babies with their family names through the use of a stencil device and ultraviolet rays. The branding is done on the thigh and is harmless as well as painless.

The artificial sunburn lasts about two weeks, which is the time most babies spend in a maternity hospital. But for two or three months after that time the letters can be brought out by special apparatus without exposing the child again to ultraviolet rays. Many expectant mothers dread the possibility of a mix-up among the babies, and while tags and footprints may be confused, the new method makes identification more sure. — Reprinted from *Int. Med. Rev.*

### Digestive Ferments Used in Treating Abdominal Adhesions

Successful experiments in the use of digestive ferments to treat troublesome adhesions which may form after abdominal operations were reported to the American College of Surgeons by Dr. Alton Ochsner and Dr. Earl Garside of Tulane University of Louisiana School of Medicine, New Orleans.

Drs. Ochsner and Garside studied 280 animals and found that in every animal adhesions reformed after operation to divide the preexisting ones. They then tried introducing various solutions into the abdominal cavity after operating on the adhesions. With a solution of the digestive ferment, papain, few or no adhesions reformed in over nine-tenths of the cases. Papain is obtained from the juice of the fruit of the papaya. Another ferment, trypsin, prevented the reformation of adhesions in nearly half the cases. The theory is that after the adhesions have been divided, the ferments act to assist in removing the excessive amounts of fibrinous adhesions before the organization of the fibrous tissue into new adhesions has occurred. — *Science News Letter,* October 24, 1931.

### The Radiological Review Radium Number

The March, 1932 issue of *The Radiological Review* will be entirely devoted to Radium Therapy, this being the fifth annual "Radium Number." Short original articles on clinical radium therapy that will be of interest to the general profession are solicited. All contributions should be in the hands of the editor not later than February 20, 1932, (P. O. Box No. 152, Quincy, Illinois).

### New Blood Test Used in Diagnosis of Cancer

A new method of detecting cancer in its early stages has been developed by Dr. Hans Jacques Fuchs, member of the physiological institute of the Veterinary University of Berlin. An account of the new method has been given by Dr. Fuchs to a *Science Service* correspondent at Berlin. Details will be published in a few months in a German scientific journal.

So far, two thousand cases have been successfully diagnosed by the new method, the diagnosis being confirmed by operation or dissection. The method also makes it possible to determine the presence of cancer when an infectious disease occurs at the same time. Further, it is claimed that by this method the success of surgical or radiological treatment of cancer can be controlled.

The new method depends on the digestion of serum from the blood of a suspected cancer patient with fibrin prepared from the blood of a normal person and with fibrin from the blood of a person known to have cancer. The digestion goes on for ten hours at a temperature of 104 degrees Fahrenheit. The protein is then removed from these samples and the amount of non-protein nitrogen present in each is determined. Depending on the amount of non-protein nitrogen present, it is possible to make a diagnosis as to whether the suspected case is one of cancer or not.

The new method is the result of five years of incessant research work during the course of which Dr. Fuchs had to make a number of pieces of special apparatus in order to achieve the necessary exactness in his determinations. The method also marks the first time that a chemical determination of a serological process has been made. — *Science News Letter,* December 12, 1931.

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### Mummy's Interior Studied Without Spoiling Exterior

With the use of x-ray photographs such as these, Dr. William H. Fox, director of the Brooklyn Museum, and Harold G. Petsing, of the Westinghouse Company, have been able to determine the condition of a mummy's interior without spoiling the specimen for exhibition purposes.

The photograph revealed a beautiful specimen and showed two small jars, whose existence was previously unsuspected, wrapped close to the head. The other mummy, normal on the outside, was found by x-ray examination to be greatly disturbed within. The head was detached and turned around so that it pointed down; the lower jaw bone and most of the teeth were missing; and most of the bones were collected in a confused mass in the center of the body.

X-ray studies of mummies have also been made by Roy L. Moody on specimens supplied by several museums. — *Science News Letter,* July 11, 1931.

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### X-Ray Treatment May Affect Plant Evolution

A new tool of importance in the control of agricultural production of the future, may be in the use of x-rays or similar shortwave vibrations, Dr. W. W. Garner, plant physiologist of the U. S. Department of Agriculture, believes.

Research in this field is so new that some of the most striking effects have not been followed far enough to reveal their ultimate results. Wild corn plants appear to have been changed from annuals to perennials at Cornell University by treating the seeds with x-rays. And in accordance with experiments in various other places, the evidence seems to be that under suitable conditions, x-rays do bring about mutations.

The scientist may therefore be able to take some sort of hand in plant evolution. The importance this could have on crop production cannot be over-estimated, Dr. Garner said. However, the future will show to what extent this new tool can be effectively applied in crop improvement.

Work along these lines upon plants is being done at the Universities of Missouri and California. — *Science News Letter,* September 12, 1931.

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### New Anesthetic Found in Accordance with Prediction

A new general anesthetic for use in surgical operations, which is more rapid and efficient than ether, chloroform or the anesthetic gases, has been discovered in accordance with a prediction of Dr. C. D. Leake, professor of pharmacology at the University of California Medical School, Dean Langley Porter has announced.

The new anesthetic is called divinyl oxide.

It is chemically related to ether and ethylene and will probably be given in the same way that ether is. However, it is superior in several ways.

Recovery is more rapid when divinyl oxide is used for an operation than when ether is used. There is less excitement and less nausea with the new anesthetic. There is also less irritation of the lungs and less disturbance of the body's chemical equilibrium. The heart action is not greatly changed.

Divinyl oxide is a liquid which boils at a low temperature. It is inflammable and as explosive as ether.

Associated with Dr. Leake in the work leading to this discovery were Mrs. Mei-Yu Chen Mai, now in Peiping, China; Dr. P. K. Knoefel, Fellow of the National Research Council; and Dr. A. E. Guedel, Los Angeles anesthetist.

While investigating the anesthetic action of ether and ethylene at the University of Wisconsin, Dr. Leake predicted that divinyl oxide, chemical relative of these substances, would prove valuable.

At his request, it was produced in a chemically pure form by Dr. R. T. Major and Dr. W. L. Ruigh of Princeton University and the Merck Laboratory for Pure Research at Rahway, N. J. It was then given a trial and as a result the world has a new anesthetic.

Clinical evaluation of the new anesthetic is still proceeding at the University of California Hospital under the supervision of Dr. H. C. Naffziger, professor of surgery, and Dr. D. Wood.

The experiments leading to this discovery were made possible by financial aid from public-spirited citizens, chiefly the Christine Breon Research Fund, Dean Porter said. — *Science News Letter,* December 19, 1931.

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## Vitamin D, the Life Saver, Also Poisonous

Pure vitamin D is a poison as well as a life-saver. This discovery was explained as one result of the "isolation" of a crystal which is pure vitamin D, announced last week by Prof. Adolf Windaus.

Isolation means that the vitamin has been separated completely from all the other substances in which it ordinarily exists. Prof. Windaus has a fragment of it in absolutely pure form. He refused today to discuss his discovery, which required four years of research, but named as spokesman Prof. Carl Oppenheimer, a Berlin editor of scientific publications.

### A Cure and a Poison

"The physiological effects of the vitamin thus isolated," said Prof. Oppenheimer, "are the same as those of sunshine."

"Three-billionths of a gram of the crystal is sufficient to relieve rickets, the diet disorder which is caused by vitamin D deficiency. But one fifty-thousandth part of a gram is poisonous.

"It remained questionable hitherto whether the poisonous effects of vitamin D were derived from the vitamin, due to too high a dose, or whether they came from some other substance that was merely mixed with the vitamin. Now everything is clear."

### How Crystal Was Obtained

The pure crystal was obtained by use of certain rays of "artificial sunshine." It began several years ago when the scientific world took notice at the discovery that either artificial or natural ultraviolet rays of light acted upon cholesterol to produce vitamin D. Cholesterol is a substance related to rare alcohols and is distributed widely in growing things.

Prof. Windaus, however, learned that it was not the cholesterol that changed into vitamin D. The vitamin came from another substance, ergosterol, which always accompanied the presence of cholesterol.

Next he found that certain wave lengths of ultraviolet transform about 50 per cent of ergosterol into vitamin D, and that the remaining 50 per cent, which is not vitamin, is easily removable.

### Reach Earth in Sunlight

A striking feature is that the wave lengths making this 50 per cent conversion are those which naturally reach the earth in sunlight. They are the ultraviolet rays down the 2,900 angstrom units, this unit being the scientific measuring rod for light impulses. Both artificial light and the sun produce ultraviolet rays much shorter and more powerful than the 2,900 kind, but those from the sun are filtered out by the atmosphere before reaching the earth's surface.

When the vitamin thus created by light has the useless half removed, part of the remaining vitamin crystallizes of its own accord. The remainder of the vitamin can be crystallized by treatment with a chemical anhydride of

citraconic acid. This process appears to remove some sort of byproduct which serves to prevent full crystallization.

The vitamin crystals absorb ultraviolet light most strongly at 2,650 angstroms. This means that the vitamin has a special affinity for ultraviolet rays of that specific wavelength power. —*Chicago Tribune.*

## New X-Ray Device Shows Up Human Interior in Relief

A stereofluoroscope x-ray instrument that shows the inner workings of the human body as though it were a moving picture has been perfected at the California Institute of Technology and will be forwarded in a few days to the Henry Phipps Institute at Philadelphia where practical medical experiments are to be conducted.

Several months ago a rough experimental model was completed and caused great interest when introduced to the medical world. When it proved a success funds were secured from the Rockefeller Foundation for construction of a more elaborate instrument designed for use in hospitals.

The instrument was developed by Dr. Jeffe W. M. Dumont, research fellow in physics, Dr. Archer Hoyt, teaching fellow in physics, and Clarence Brandmyer, at the California Institute of Technology. These men worked out the details of the instrument which was built during the last three months.

### Single Transformer

An announcement inviting the public to view the instrument reveals that it consists of two x-ray tubes connected to a single transformer so that they are alternately caused to emit x-rays by alternations of a fifty-cycle alternating current. The alternate x-ray impulses emitted by the tubes project alternate shadow pictures of the object to be viewed on a single fluorescent screen. Since the tubes are spaced apart at approximately the same distance as the distance between the two eyes, the shadow pictures projected on the screen differ slightly in the point of view in the same way that two images in the right and left eye differ respectively from each other when the eyes view any object in three dimensions.

To give the impression of a three-dimensional stereoscopic plastic relief, it is only necessary to arrange that each eye shall see one and only one of the two images formed by the two tubes. This is accomplished by means of a special rotating shutter placed before the eyes and driven by a synchronized motor in such a way that the right eye looks at the time the right-hand x-ray tube is emitting rays and the left eye looks at the time the left tube is emitting.

By observing certain geometrical relationships between parts it is possible to have the stereoscopic image appear in space in front of the screen as an exact scale reproduction. Calipers are provided that can be introduced into the image and brought into apparent contact with any two parts of the image whose separation or size is desired. — *Science News Letter,* October 24, 1931.

## Artificial Gamma Radiation Approximates Cosmic Rays

With production in Germany of artificial gamma rays of intensities that approach those of the mysterious cosmic rays, and with twenty million volts promised by a Princeton physicist's new apparatus, Prof. Arthur H. Compton, Nobel prizeman, foresees the possibility that man may be able eventually to tap the internal energy of matter and put it to work. A new idea of how the energy stores of our brilliantly radiating sun are supplied was also advanced by the University of Chicago professor, at a conference sponsored by the American Institute of Physics at New York.

An experiment by Dr. Walter Bothe, German physicist, was heralded by Prof. Compton as "remarkable" and as accomplishing what has long been "considered an impossibility." On his recent trip to Europe, Prof. Compton learned that Dr. Bothe has been able to produce artificial gamma rays by bombarding beryllium metal with alpha rays. These artificial gamma rays are an approach to artificial cosmic rays. They are the same kind of radiation as light and x-rays, except that they are much more penetrating. The beryllium metal from which they were obtained is the lightest metal that can be used practically, and the alpha rays that were used by Dr. Bothe in the bombardment are speeding hearts of helium atoms given off when radium and other elements disintegrate radioactivity.

### Amazing Result

The amazing result of Dr. Bothe's experiment, as explained by Dr. Compton, is

that there is obtained from the bombardment of beryllium, through the giving off of the artificial super-gamma ray, much more energy than was supplied by the attacking helium atom heart. This is interpreted to mean that what happens is not the disintegration of the beryllium but an actual process of synthesis in which a heavier element, carbon, is formed and energy is liberated in the form of the artificial "soft" cosmic rays.

If that is so, the hope of obtaining energy from such artificial synthesis is due for a revival. There is hope also that one element can be changed into another and that the age-long wish for transmutation may be fulfilled.

The practical application of this possible new energy source is made difficult by the fact that only one in fifty thousand of the projectiles hurled at the beryllium hits its mark and the process is therefore dreadfully inefficient. Although there may be places in the universe where the synthesis proceeds at a much faster rate, the physicists are frankly not optimistic about making this energy source competitive with coal, oil and water power.

But conditions in the sun may be different, and the theory is advanced that solar energy that warms and lights our earth may be the result of synthesis in the sun rather than the present favorite theory of the conversion of matter into radiant energy. This idea carried to its logical conclusions may greatly affect all ideas of how the solar system and our earth originated.

In testing these latest physical theories and providing more powerful electrical tools, a new electrical generator developed at Princeton University by Dr. Robert J. Van de Graaff, now of the Massachusetts Instiute of Technology, will be useful. A large generator to be built in an airship hangar near New Bedford, Mass., is expected to produce ten to twenty million volts. A model built at Princeton gave one and one-half million volt sparks that jumped three feet.

Simplicity marks this new method of producing previously unattainable direct current voltage. It operates on the ancient principle of static electricity, that is utilized when you obtain sparks from a cat's back or scrape your feet across a rug and then touch metal. In the large generator the operator will sit inside one of two fifteen-foot-diameter electricity-collecting spheres, and although he will be charged with from five to ten million volts, they will not harm him because he will not be grounded.

Prof. Compton, as the result of his survey of present knowledge of the atomic nucleus, believes that "we may have to find some fundamental principles of the physical world which are as yet unknown" before the nucleus can be understood. He recalled that the Danish physicist, Prof. Neils Bohr, has suggested that perhaps the principle of the conservation of energy, long considered the foundation rock of modern science, is not obeyed when electrons are ejected from atoms.—*Science News Letter,* November 21, 1931.

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**Price of Cruiser Asked for Cancer Research**

"One cruiser for cancer would insure the banishment of this plague."

This dramatic statement was made at the meeting of the American Chemical Society at Washington by Dr. Ellice McDonald of the Cancer Research Laboratories, Graduate School of Medicine, University of Pennsylvania.

Dr. McDonald expressed great hopefulness over the possibility of the ultimate discovery of a cure for cancer, but said that time and money are needed for this work.

Criticizing the demands of the Navy League for huge sums of money for cruisers, he pointed out that the price of one cruiser would finance the work of the cancer research institutes of the country for 100 years.

Cancer is taking a toll of 130,000 deaths a year, he said. About three-quarters of a million people in the United States suffer from cancer at the present time. The mortality from cancer has increased by more than half in twenty-five years, and if the same rate continues, the number of women dying from cancer 60 years from now will be 192 per 100,000 instead of 117 per 100,000 as at present.

Dr. McDonald described the work in his laboratories where chemists, physicists, biologists and other scientists are united in the fight against cancer. These investigators have found that blood of persons suffering from cancer is more alkaline and contains more sugar than normal blood. They believe this blood sugar is different from normal blood sugar and that it is of the active or gamma type of sugar. Moreover, the cancer cell adapts this active sugar in a different way from normal, according to their theories.—*Science News Letter,* November 21, 1931.

# THE STUDENT'S LIBRARY

## BOOK REVIEWS

ELECTROTHERAPY and The Elements of Light Therapy. By *Richard Kovács,* M.D., Clinical Professor and Director of Physical Therapy, Polyclinic Medical School and Hospital, New York, etc. Pp. 528 with 211 illustrations. Cloth. Price, $6.50 net. Philadelphia: Lea & Febiger, 1932.

The present work is so overwhelmingly superior to that of other recent publications on the subject that it is somewhat difficult to review it without overpraise. It is felt that the author has rendered superior service to the cause of Physical Therapy in America because he has presented the facts in a manner suggestive of a cosmopolitan orientation with the progressive thoughts on the subject. The book is of generous proportions, and is limited in its scope, to a lesser extent, to light therapy. It should, however, be noted that whatever the latter lacks in breadth it generously makes up in succinct information. The work as a whole is representative of a sane attitude in regard to the many supposed values associated with physical therapy procedures. Indeed, it is noted throughout this work that, whereever possible, the author has tended to stress mainly those facts that have emerged from the crucible of experience and found generally acceptable to those in present authority. No doubt a certain portion of the readers may feel that the physics of electricity as presented in part I of this treatise has been somewhat overly skeletonized. There may be some justification to this, because only the briefest mention is made regarding the latest theories and concepts of the new views on electrophysics and radiation. It is, so to speak, begging the question to recommend the reader to seek such information in a high school volume of physics. Those of us who have actually tried this, know that such a quest is an adventure in disappointments, because of the confusion developing while searching through the hieroglyphics of mathematical formulae.

Succeeding this discussion, the exposition is separated under three major divisions: namely, "General Electrotherapy and Electrodiagnosis"; "Elements of Light Therapy"; "Applied Electrotherapy." These three portions make up the major opus of the work and unquestionably represents the most scholarly contribution in recent years. Considerable detail has been devoted to the evaluation of various electrical currents of low frequency (galvanic, faradic, and sinusoidal), static electricity and high frequency current in relation to their possibilites and limitations as therapeutic agents. The author has here dipped deeply not only into his own experience but has substantiated many of his personal opinions by the work of many authorities, both foreign and domestic. Thus, the broadest possible point of view is presented for the readers convenience, not only by way of the actual text itself, but also through the channels of the generous reference appended at the end of each chapter. It is particularly desirable to call attention to the comprehensive discussion on electrodiagnosis, a discussion usually absent from average American text books on physical therapy, or at best, mentioned with a degree of inaccuracy unworthy of its importance. The three chapters devoted to its exposition is one of the clearest presentations on the subject. It is full of practical suggestions, of value not only to the general practitioner, but, particularly, to those who daily are in special contact with representative material in need of such evaluations.

Four meaty chapters are devoted to the exposition of medical and surgical diathermy. In this space the author has managed to present the outstanding concepts, facts and theories, physical and physiologic effects of this important agency. In spite of the limited space, the discussion is well rounded and inclusive. Kovács has here managed not only to stress the important advances and the substantial facts regarding its action, but has at the same time pointed out the weakness' of the various borderline theories current among certain American leaders of Physical Therapy.

The four chapters devoted to the consideration of "Elements of Light Therapy" maintain the high standard set by the author in the previous section of this treatise. The entire discussion is stripped of all redundancy. Every paragraph is crammed full of important facts. Separate chapters are set aside for discussions on "The Physics of Radiation"; "Photothermal Radiation"; "Photochemical Radiations—Physics and Effects," and "Photochemical Radiation—Clinical Uses." Indeed, this section is so fully rounded out with scientific data that it could well be considered as a special monograph on the subject.

Lack of space will not permit further consideration of the remaining section:—"Applied Electrotherapy." Here also, the discussion is indicative of high orientation in Physical Therapy.

In the light of constructive criticism, may it be noted that editorially and in physical make-up the book shows degrees of haste and neglect which future printings and new editions no doubt will correct. In spite of this, the author, by virtue of his high scholarship, has set a standard for future publications on the subject of physical therapy that will be difficult to overreach. The book is a splendid contribution and is destined to high success.

ELECTRICITY. WHAT IT IS AND HOW IT ACTS. Two Volumes. By *Andrew W. Kramer,* Associate Editor Power Plant Engineering, Associate Member American Institute of Electrical Engineers, Institute of Radio Engineers. Pages (Vol. 1), 274; (Vol. 2), 290, profusely illustrated. Cloth, price, $2.00 per volume. Chicago: Technical Publishing Company, 1929 and 1931.

The medical profession has long been in need of a work on electricity that not only attempted but really explained as far as present knowledge is able, the mechanism, the theories, and the accepted concepts regarding the nature and action — "what it is and how it acts" — of that mysterious entity, electricity. It is generally agreed that the weakest part of our medical discipline has been our difficulty in explaining the very fundamentals of our practice. Writers have been wont to shift the responsibility of this portion of their exposition upon the shoulders of other authorities or have referred their readers to other sources. Thus the student of medical electricity has for a long time experienced the feeling that these fundamentals were either too profound for his understanding, or he has come to realize that in actuality the apparent profundity of this subject was in fact nothing more than the muddled and chaotic writings of those completely out of touch with the subject. It has largely been due to such experiences that the medical profession in particular, although at present less resistive to the uses of electricity as a therapeutic adjuvant than in previous times, is today in agreement with the general sentiment that nobody knows what electricity is, and least of all those advocating its use as a specialty in medicine.

The author, by profession an engineer, and one highly endowed by scholarship to present the subject, advances the proposition that electricity is a knowable phenomenon which can be explained on logical grounds. He is fully cognizant of the weight of current opinion regarding the mysterious and unexplainable qualities of electricity, and hence qualifies in the preface of the first volume his boldness in choosing the above title to this work by the following statement: "At a time when the scientific world is undergoing a house cleaning, when many of our most cherished ideas and theories are being upset by the physics and when the theory of relativity and the quantum hypothesis are building for us a strange and new universe, it may be somewhat of a presumption to offer a book purporting to explain the nature of electricity. Perhaps it is. The title of the book, I admit, is certainly an audacious one and, mentally, I can picture the purists holding up their hands at the horror of it. Indeed, were it not for the sincere desire to dispel somewhat the unfortunate mental attitude which exists in regard to the nature of electricity and to indicate to those who are curious what is known about electricity, I, probably, would never have had the presumption to select it." He is, however, convinced that "there is no valid reason for attributing a more profound mystery to electricity than to other natural phenomena."

The thesis of this treatise is therefore directed to the elucidation of the basic facts, theories and newer concepts regarding electricity, matter and radiation. The entire exposition deals with the very fundamental principles of the subject as well as the latest advances within the field. The subject matter has been logically presented in a delightfully informal style. It begins with the most elementary facts and lucidly carries the reader to the most involved portions of our present concepts in the subject, without so much as betraying his interest or losing him amidst highly complex mathematical formulas. According to the author, "the method of presentation has been maintained rigidly simple so as to enable those not mathematically minded to grasp the fundamental principles involved. In some instances this has made necessary the use of analogies which, perhaps, are not fundamentally accurate, but where these are employed, attention is directed to the fact and the reader is cautioned not to regard the analogies too seriously." Indeed, the work is a remarkable demonstration of the fact that highly mathematical and technical subjects can successfully be brought within the comprehension of non-specialized readers. The author exhibits a rare ability of reducing the frozen facts of science into an exposition that glows with the warmth of veritable romance.

The first volume brings down to date the facts connected with the most authoritative concepts of the nature of electricity. This volume, in addition to many other subjects, touches on the nature of the electron, its properties, size and arrangement; the structure of the various elements; matter in the aggregate; the conduction of electricity through gases, liquids and solids, etc. The first volume discusses, therefore, "only those phenomena which are not concerned directly with the electromagnetic radiation of energy." The second volume discusses in considerable detail the facts of "radiation phenomena, radio-activity, the electron theory of magnetism and related subjects."

The reviewer's apology for devoting such considerable space to a non-medical topic is the fact that he feels that he has been fortunate in presenting to the reader's attention the most comprehensive treatise on electricity that has thus far been written in the English language. It is indeed the very book that medical students of electrotherapy and radiation have long sought. We call attention to its high qualities in no uncertain terms and urge every sincere student of the subject to obtain it for early perusal. We cannot refrain from congratulating the author on his contribution, realizing the great labor and the heavy sacrifices that it involved.

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LES ENFANTS TUBERCULEUX. Par Le Docteur *J. Talliens,* Professor de Clinique Infantile a l'Universite de Lausanne. Pages 210. Paper. Price 25 francs. Paris: L'Expansion Scientific Francaise, 1931.

In the foreword to his book the author wishes it understood that his effort will consist in answering one question: namely, "What should the physician do for a child who is supposed to have or has tuberculosis?" He purposely omits the pathological

anatomy and bacteriology of the subject, and avoids the repetition of the enormous bibliography on tuberculosis.

He lays great stress on the B. C. G. vaccination, and shows why he is personally opposed to its practice. A capital fact should dominate in the prevention of tuberculosis, and that is to remember that one is not born tuberculous, but may become so. Emphasis is also laid on the fact that children living in a tuberculous environment show a positive cutireaction in practically 100 per cent of the cases. Tuberculosis is not hereditary but contagious in direct proportion to the child's lowered resistance occasioned by poor hygiene and insufficient alimentation. Tuberculosis in the infant is especially severe, and it is usually in the first year of life that tuberculous meningitis claims its victims. A diagnosis in the infant is also difficult, as the cutireaction and the presence of fever, as well as other signs elicited through physical methods of examination, may be all absent until the disease is well advanced.

After considering the different tissues which the tuberculous process may affect in the infant, Taillens directs attention to the older child, i. e., between the ages of 1 and 14, and proves them to possess a greater resistance to the bacillus as the child grows older. He lays very great stress on the combined methods of radiography and the polycutireactions as a method to clarify obscure cases. He points, further, to the necessity of developing proper acumen in interpreting the x-ray findings, in order to give adequate weight to the method. Attention is directed that the most frequent tracheobronchial adenopathy lies at the base and to the right of the heart and is the seat of predilection for tuberculosis in the child. The author recognizes the value of the blood sedimentation rate in the clinical evolution of tuberculous lesions; he also cautions the physician against the validity of the Besredka reaction, and agrees with the Vernes-resorcine reaction and its seroflocculation.

In the chapter on treatment, Taillens reviews the values of open air therapy, heliotherapy, actinotherapy, tuberculinotherapy, the value of calcium fixation through actinotherapy, and finally discusses the question of pneumothorax and its indications. More stress, however, is laid on the prophylactic treatment as conducted by the boards of health of our cities and through some insurance companies, such as the Metropolitan Life.

The last chapter is devoted to a detailed discussion of the B. C. G. vaccination. The author maintains that tuberculosis is not a disease where one creates immunity, and that no vaccination will cause a permanent immunity. He reviews the experimental work done on animals and on human beings, and raises two questions: "Is the B. C. G. vaccination harmless? Is it reliable? Forty pages of this last chapter are devoted to prove the danger and unreliability of the B. C. G. vaccination. He proves that the above vaccination method is not only harmful, but may actually create lesions which may be eventually fatal; and where isolation and hygiene have proved the best method of attack, no proof of immunity has as yet been developed through the administration of the above method of vaccination. He therefore prefers the former methods of dealing with the prophylactic treatment, which have been proved at least safe and harmless.

Doctor Taillens concludes that the whole study of the B. C. G. vaccination has left the experimental realm too soon, and that just as good results and a safer vaccination can be effected with a vaccine composed of dead bacteria as with the B. C. G. vaccine, which is composed of live though attenuated bacteria.

The facts as here presented indicate that the author has been a critical student of the subject. His conclusions indicate a deep study of the literature concerning the subject and a broad orientation with the specialty.

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REPRINT AND CIRCULAR SERIES OF THE NATIONAL RESEARCH COUNCIL: SIXTH REPORT OF THE COMMITTEE ON CONTACT CATALYSIS, By *Robert E. Burk*, No. 83, paper, pp. 47, Price 50 cents. SEVENTH REPORT OF THE COMMITTEE ON CONTACT CATALYSIS, ENZYMES CATALYSIS, by *E. F. Armstrong* and *T. P. Hilditch*, No. 90, Paper, Pp. 15, Price 25 cents. EIGHTH REPORT OF COMMITTEE ON CONTACT CATALYSIS, by *J. W. Frazer*, No. 94, Paper, Pp. 54, Price 50 cents. Washington, D. C.

The purpose of the present reports arose from "newly-developed catalytic processes in industry, such as the synthesis of petroleum, methanal, and progress in the study of enzymes."

The sixth report summarizes the material found in the previous reports published by the Committee of the National Research Council on Contact Catalysis. This report discusses: "Contact Catalysis and Reaction Velocity in General," "Facilitation of Energy Transfer," "Facilitation of Energy Transfer to the Reacting Molecule," "Lowering of the Heat of Activation," "Molecular Distortion Theory," "The Nature of Chemical Bonds," "Condition of Adsorbed Gases," "Differential Heats of Adsorption," "Supported Catalysts," "Films on Catalysts," etc. Such agents as poisons, dust particles, and moisture are treated as catalysts. The results are effectively summarized in short sentences containing, we think, a vast amount of interesting and valuable information. Some facts are given to show why catalytic results are "often ambiguous and difficult to interpret."

The seventh report which deals with the nature of "Enzymes" is of especial interest to the medical profession, particularly the pathologist. These men, (chemists), who make this contribution tell us that "perhaps only those wedded to this field realize how very delicate is the balance and how elaborate the mechanism which is controlled by those subtle agents, Enzymes."

The eighth report considers the "introduction of the new quantum mechanics." The report contains references to the work of such outstanding men as Langmuir, Lennard-Jones, Freundlich, Davisson and Germer, and Pinkus.

While these reports may not have a general appeal, they do, however, have definite value to those especially interested in this branch of science. The contents are tersely presented, the discussions con-

cise, and the facts are impressive. In writing reports, clinical or otherwise, the style of these scientific investigators could be more emulated by others. Much of our empirical writing, no doubt, would never be published if the conservative, authoritative "step-by-step" method of these men were mastered. Unless we are writing for pure entertainment we should offer only conclusions such as found in these reports from adequate work and with ample evidence of previous exhaustive reference to what has been done by workers of authority in the particular field.

The help which these reports would give one contemplating research work, and its consequent report to our fellows is very great for the small investment asked for these reprints.

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CALCIUM METABOLISM AND CALCIUM THERAPY. By *Abraham Cantarow*, M.D., Assistant Demonstrator of Medicine in the Jefferson Medical College, Philadelphia. With a Foreword by *Hobart Amory Hare*, B.Sc., M.D., LL.D., Professor of Therapeutics, Materia Medica and Diagnosis in the Jefferson Medical College, Philadelphia. Pp. 215, illustrated. Limp binding, $2.50, net. Philadelphia: Lea & Febiger, 1931.

Calcium therapy and its metabolism is today regarded as one of the most interesting and important problems in medicine. Information in this subject has heretofore come to the physicians' attention in a somewhat scattered and indirect manner. The author aptly calls our attention to this in his preface: "It is unfortunate that the complexity of the mechanism concerned with the regulation of inorganic metabolism, involving as they do intricate physico-chemical changes in the blood and tissues, renders the bulk of the literature on this subject unavailable to the clinician not fundamentally trained in this direction." Hare in his foreword to this treatise probably offers as true an analysis of our chaotic and disorganized attitude toward calcium therapeutics as can be found anywhere. He feels that the subject is of great interest and importance even though our knowledge is imperfect and incomplete. He states, "Lack of knowledge on the part of the profession of medicine in general as to the duties or function of calcium in the organism is such that it is either not employed when it should be or, all too frequently, is given to patients who do not need it, with the result that the body must promptly get rid of it by the kidneys or bowel if harm is not to result. Indeed, the present use of calcium is, in many instances, the introduction of an agent of which the physician knows little into a body of which he knows less, in entire forgetfulness of the universal rule that any agent capable of doing good is capable, if improperly used, of doing harm."

The present treatise, coming as it does from a clinician oriented in laboratory methods and one who has been particularly interested in this subject, is therefore, timely and authoritative in nature. That calcium has a wide range of application, indication and also contraindication is the theme of this treatise. The author early advances the explanation of why the subject has been surrounded with difficulties. He says, "Unless one is familiar with the significance of calcium physiology, it is impossible to appreciate the various functional aberrations which may result from a disturbance of calcium metabolism. Similarly, it is difficult to understand the therapeutic applications of calcium in apparently unrelated conditions."

The present volume therefore deals with the foregoing phases of calcium. The contents are roughly divided into three parts, the first dealing with normal calcium metabolism; the second with abnormal calcium metabolism; the third with calcium therapy. The author has thus introduced what would appear to the ordinary clinician a surprising wealth of information. An exhaustive amount of fundamental information has been incorporated, out of which is born to the average reader an intelligent concept of the subject. The author is to be commended for his clear and concise exposition and for the simplification of what is generally appreciated to be a rather complex subject. One justifiably feels that the author has expended much labor to bring the subject down to date and to present it in a form of interest to the medical profession. This book should be widely read by all progressive members of the medical profession.

# INTERNATIONAL ABSTRACTS

**The Sinusoidal Current in Chronic Gonorrhea of the Male. Harold Nufeld, M.D.**

*N. Y. State J. of M.,* (Aug.), 1931.

For the past several years gonorrhea in the male, both acute and chronic, has been treated with the electrical modalities. Of these, diathermy is the most effective; and yet under this treatment many cases of urethritis persist with a chronic discharge or shreds. It is in these cases that the sinusoidal current can be used successfully. A twenty-minute application of ten to eighteen milliamperes three times weekly has proved valuable. In an occasional obstinate gonorrhea, the surging current, by its more vigorous reaction is found to be more beneficial than the sinusoidal current alone.

The value of the sinusoidal current depends upon its accurate application to the focus of infection with the proper electrodes. For this purpose the two-glass test is a simple, accurate enough method. If the first glass alone is cloudy or alone contains shreds we know that the chronic infection is limited to the anterior urethra. In such a case the penis is wrapped in moistened cotton and electrodes are applied over this so as to include the urethra. The current is gradually turned on till the patient experiences a drawing feeling, or a feeling of waves. Should the case show a clouding of both glasses, one electrode is placed in the rectum so as to include the prostate.

The rational of the treatment is clear. According to Granger, "The sinusoidal current is an excellent stimulant for unstriated muscle. Hence, it is useful in treating intestines, oesophagus or uterus, causing physiological contractions. Under the fluoroscope, after a barium meal, the intestines show (with this current) an increased peristalsis. Some indications for its use are atonic constipation, enlarged prostate where the sine waves will take the place of prostatic massage."

The male genital tract is admirably suited histologically for the treatment with the sinusoidal current. Between the visceral portion of the tunica vaginalis and the transversalis fascia of the testes lies the internal cremasteric muscle, a layer of unstriated muscle fibers. The vas efferentia near the epididymis contains endothelial cells resembling nonstriated muscle cells; while the epididymis and the seminal vesicles have outer longitudinal and inner circular smooth muscle layers. The vas deferens has an involuntary muscle structure consisting of a middle circular and an outer and inner longitudinal layer. The ejaculatory ducts contain a poorly developed inner circular layer, but a well-developed longitudinal layer of non-striated muscle, which is continuous with that of the prostate's capsule. The external envelope of the corpus spongiosum of the penis is formed partly of unstriped muscle tissue, and a layer of the same tissue immediately surrounds the canal of the urethra.

The sinusoidal current through its ability to contract smooth muscle stimulates the involuntary musculature of the genital tract, producing an emptying of the prostate, seminal vesicles, glands of "Littre" of the urethra, etc., with an improvement or cure of subjective and objective symptoms.—(*Med. Times and L. I. Med. Jour.,* LX, **1**:33, [Jan.], 1932.)

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**Physical Treatment of Prostatic Lesions. E. C. Titus and V. C. Pedersen.**

*Lancet,* **2**:788, (Oct. 10), 1931.

These authors discuss the various methods of physiotherapy indicated in prostatic lesions. These include heat by conduction (diathermy and galvanism); heat by radiation (luminous and infrared rays); x-rays in small doses as a stimulant and in large doses as a resolvent of hyperplastic tissue; static wave current for contracting fibrillary tissue; galvanism for sedative or relaxing effect through the negative pole and stimulating or contracting effect through the positive pole. In congestion of the prostate after removal of the causes or treatment of the primary lesion, the chief indications are decongestion and soothing. For this the diathermy-static wave or light static-wave sequence is indicated; radiant heat and light are also of value; the static wave current gives the best deep massage. If no static machine is available, the sinusoidal current at a rate of 30 to 60 cycles per minute also has a massage action. The primary lesion may require operation, and if so, this should not be delayed. In acute inflammation, sedative treatment and decongestion are indicated and are best supplied by radiant heat and light in alternation with mild diathermy with two large electrodes. In chronic inflammation, mild stimulation is indicated, by carefully graduated diathermy through the prostatic electrode, and by the high vacuum glass electrode attached to the negative pole of the static machine or the Oudin terminal of the high frequency machine. With retention of the exudate, massage with the static wave or sinusoidal current is given. In abscess radiant heat or light and infrared rays may be used for quieting pain and vascular spasm and reducing edema. No electrotherapy of the massage type should be used unless free and adequate drainage of pus is provided by surgical measures. Most cases of prostatic hypertrophy are surgical, but the need for surgery may be reduced by the early employment of physical measures. Congestion and inflammation of the prostate associated with hypertrophy may be treated as indicated under each of these heads. In the soft or adenomatous type of hypertrophy, the static wave current relieves stasis and atony; and the x-ray is valuable to reduce cellular infiltration and proliferation. The fibrous type of hypertrophy is usually surgical. In malignancy

of the prostate, x-ray treatment pre- and post-operatively is indicated, with cross-raying from the navel down. Radiant light and heat applied two visits after the x-ray prevents or decreases x-ray dermatitis. In calculus of the prostate, physical therapeutic measures are indicated only after the surgical removal of the concretion to combat the chronic infection. These conclusions are based on the authors' experience in both urology and physical therapy for over twenty-five years.—(*Medical Times and Long Island Med. Jour.*, LX, **1**:32, [Jan.], 1932.)

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**Seasonal Variation in the Antirachitic Effect of Sunshine. F. F. Tisdall and A. Brown.**

*American Journal of Diseases of Children*, **42**: 1144, (November), 1931.

These men note that their studies for the last four years on the antirachitic effect of sunshine in Toronto, Canada, have shown that the sun's rays have a less marked antirachitic effect in the latter part of October, November, December, January and the first part of February. These experiments showed that there was a sudden increase in the antirachitic effect of sunshine about February 15th, and a sudden reduction in this effect about October 15th. It has further been found that this change in antirachitic effect is largely dependent upon the sun's altitude above the horizon; a critical altitude has been found to be about 35° below which the antirachitic effect of the sun's rays is reduced. When the sun is low in the sky, the rays pass through a greater amount of the earth's atmosphere, reducing the biologically active ultraviolet rays. On the basis of these observations, the season of the year during which rickets is most likely to develop can be calculated in any part of the world. One other factor must be considered, however, and that is altitude. When the height above sea level is increased, the air mass through which the sun's rays must pass is reduced. Hence in places at high altitude, the sun's rays will have an effective antirachitic action when the altitude of the sun is less. Investigators in Denver, Colo. (Lewis, Frumess and Stein), where the altitude is 5,300 feet, have found the winter sunshine to have a marked antirachitic effect, as would be expected from these observations. As most of the thickly populated places of the world are at comparatively low altitude (less than 1,000 feet), the practical value of the authors' conclusion that a marked increase occurs in the antirachitic effect of sunshine when the sun is at an altitude of 35° or more, is not altered.

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**The Effect of Split Doses of Gamma Radiation on Tissue Cultures in Vitro. F. G. Spears.**

*Brit. Jour. Rad.*, **4**:680, (November), 1931.

(a) Effect on Mitosis.

Exposure of cultures to 100 mg. radium (element) at 0.5 cm. for 2½ minutes causes a diminution in mitosis followed by a compensatory increase. Exposure for 5 minutes produces a similar effect.

Two irradiations, each of 2½ minutes, give a different effect from a single exposure of 5 minutes. The effect further varies with alteration in the interval between the exposures. An interval of 80 minutes is more effective in bringing about a diminution in mitosis than an interval of 160 minutes.

(b) Lethal Effect.

When cultures are exposed to 300 mg. radium at 0.5 cm. for 6 hours, a delayed lethal effect follows, and all the cultures die within 16 days. In this case it is immaterial whether the dose is given all at once or in six fractions of one hour each at intervals of 24 hours.

(c) Enhanced (Lethal) Effect from Splitting a Given Dose.

A similar delayed lethal effect can be obtained by a much shorter total irradiation if the dose is appropriately divided. By this means the effect of a given irradiation may be greatly enhanced. Exposures to 300 mg. radium for 2½ minutes at intervals of 80 minutes, until a total exposure of one hour has been given, produces a delayed lethal effect equivalent to that following a continuous irradiation of 4½ hours.—*Author's Summary.*

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**The Measurement in "R" Units of the Gamma Rays From Radium. W. V. Mayneord.**

*Brit. Jour. Rad.*, **4**:693, (December), 1931.

The paper discusses the physical aspects of the problem of dosage in radium therapy. Various units are discussed and reasons given for the choice of the "r." unit. Experimental arrangements are described, including a small ionization chamber suitable for measurements in the vicinity of a radium needle containing a few milligrammes of Ra. element. The apparatus is calibrated in "r." units by subjecting the chamber to a beam of hard x-rays, which is simultaneously measured by means of a second thimble chamber. The distribution of intensity around a 5-milligramme needle is mapped out. The intensities in r./mg./hr. are measured and found to be in agreement with experiments by Glasser. Using probable data the intensity of radiation at definite distances from a radioactive source are calculated and shown to agree with the experimental results. The relationship between the international r. and the Solomon R. is calculated, and it is shown that 1 r./sec = 1.65 R. This value is in good agreement with experimental results. The "Unit Skin Dose" is of the order of 1800 r. for hard $\gamma$ rays. The Mallet D. unit and U. S. D. of Martin and Quimby are discussed and shown to be probably of the order of 117 r. and 1400 r. respectively.—*Author's Summary.*

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**Refinements in Surgery of the Tonsils Including Electrosurgery. F. B. Balmer.**

*Ill. Med. Jour.*, **60**:458, (December), 1931.

1. The control of tonsillar bleeding in accordance with the basic principles of general surgery is very essential in the removal of tonsils.

2. Faulty operative position and lack of definite precise technique is greatly responsible for the majojrity of unsatisfactory postoperative results in tonsillectomy.

3. A technique is offered that enables the operator to control the situation at hand.

4. All tonsils are suspicious, especially in adults.

5. There can be no doubt as to the beneficial results attendant on the proper removal of diseased tonsils.

6. Electrosurgery and electrocoagulation in particular do not replace surgery in the removal of tonsils. It is better suited to certain selected cases.

7. No method of tonsil removal is ideal. The combination of surgery and electrosurgery is a means of approaching the ideal. Surgery will continue to be the method of choice, and where it is contraindicated, electrosurgery may be considered as an appropriate and scientific aid to classical surgery.

8. The surgeon should be equipped to use the method best suited for the conditions at hand and not be limited by lack of ability, knowledge, nor equipment.

9. Diathermocryptectomy or removal of the cryptic portion of the tonsil is a commendable, worthwhile, simple procedure to be considered under circumstances where a conservative procedure is indicated or necessary.

10. Electrocoagulation is a safe, tedious, time consuming, ultraconservative procedure requiring judgment, technical skill, patience and meticulate care.—*Author's Conclusion.*

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**Circulation in Pyrexia. H. C. Bazett.**

*Jour. A. M. A.*, October 31, 1931.

H. C. Bazett, Philadelphia, points out that studies of the circulation in fever both in animals and man have been inadequate, and he expresses the hope that a more systematic study may be possible. For such studies the present methods of blood pressure measurement must be improved, and a greater capacity of analysis must be developed, since the respiratory methods of measuring circulation rate are unlikely to be adaptable to these cases. By improved technic in measuring blood pressure, by a study of the character of the pulse wave, by consideration of the complexities introduced by end and lateral pressure heads, and by careful standardization of any calculations through comparison with circulation rate measurements of the respiratory type, it may ultimately prove possible to unravel the complexities of the circulatory changes in such patients by the use of relatively simple technical methods.

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**The So-called Grenz Rays. Toyama and Ichikawa.**

*Jap. Jour. Derma. and Urol.*, (September), 1931.

The authors discuss the use of the so-called Grenz or borderline rays. These have a penetrating power superior to that of ultraviolet rays but inferior to that of x-rays. Their use is particularly indicated in the treatment of such dermatoses as show important pathological changes in the epidermis or the immediately underlying layers of skin.

The Grenz rays are also of value where the Röentgen rays while possibly more efficacious than the Grenz rays, are likely to do damage to the underlying structures. On account of their safety the Grenz rays are excellent in the treatment of the hairy scalp, the eyebrows and lids, and the scrotum. They are especially recommended in the treatment of Bowen's disease, Darier's disease, erythrodermia scarlatiniformis recidivans, superficial cancer and lupus vulgaris, lupus erythematosus, pigmented naevus, psoriasis, etc.—*Uro. and Cut. Rev.*, (January), 1932.

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**Radiation Therapy of Malignancies of the Bladder and Prostate. Ira I. Kaplan.**

*Urol. Cut. Rev.*, (January), 1932.

The methods described above present a new procedure for the treatment of cancer of the bladder and prostate.

Small doses of radium, heavily filtered, are placed on the surface of bladder tumors and directly into the prostate.

The radium reaction is not severe and sloughing and ulceration seldom occur.

No painful sequelae follow this method of procedure.—*Author's Summary.*

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**The Grenz Ray in Dermatology. Lochmann and Lowenstein.**

*Münch. Med. Wochen.*, (October 16), 1931.

The authors describe the technic applicable to the use of the so-called *Grenz* or borderline rays in the treatment of skin diseases.

Then they describe their results with this somewhat new and very interesting agent. The *Grenz* rays are especially useful in treating diseases of the hairy scalp as they do not cause a loss of hair. They can be used intensively until a therapeutic effect is obtained without fear of serious burning of the skin or injury to underlying structures.

The authors have cured a large number of dissecting room tubercles of the fingers among the personnel at the Pathological Institute. Remarkable improvement has resulted in all these cases even those which had resisted every known sort of treatment, including x-ray therapy over a number of years. They have also had striking success in the treatment of tuberculosis of the mucous membranes and in granuloma annulare. Itching dermatoses were immediately favorably influenced. Mycosis fungoides, ordinary psoriasis, and basal cell carcinoma were all influenced in a remarkable manner by these *Grenz* rays.

Of especial interest is the effect of general radiation as opposed to local radiation. General radiation with *Grenz* rays has an effect upon the vegetative nervous system and the endocrine glands. General radiation was employed in the treatment of sclerodermia, lichen ruber planus, total alopecia, psoriasis complicated with joint disease, acne vulgaris. Their results were good in these conditions, but they did not influence acne rosacea. General radiation had also a remarkably favorable effect in cases of vitiligo.—*Uro. and Cut. Rev.*, (January), 1932.

**The Influence of Ultraviolet Rays on the Cerebrospinal Fluid. E. Meumann and O. Riebeling.**

*Arch. f. Psychiat.*, **90**:302, 1930.

The authors report a series of experiments in which cerebrospinal fluid and diluted blood serum were subjected to the influence of ultraviolet rays. The construction of a special apparatus for this puspose is described briefly. The cerebrospinal fluid is placed in a porcelain container, and the ultraviolet rays coming from a lamp at a distance of 32 cm. (in some of the experiments, 16 cm.) are directed on this container through the intervening medium of a running stream of water. The effects of the rays on the Wassermann reaction and other immunologic tests, as well as the albumins and total nitrogen in these fluids, were studied. The observations are summarized as follows: (1) The ultraviolet rays cause a reduction in the strength of the bodies that are responsible for the Wassermann reaction in the cerebrospinal fluid. In most cases the Wassermann reaction becomes negative. The length of time necessary for this change differed with the fluids of different patients. (2) The complement and normal amboceptor of the serum and the latter in the cerebrospinal fluid also seem to suffer a decrease in strength and quantity when subjected to ultraviolet rays. (3) The albumins of the cerebrospinal fluid and of the diluted serum are decreased in quantity under the influence of these rays. Outside of the absolute decrease, there is a further relative decrease of the albumin and an increase of the globulin. (4) These changes are accompanied by a change in the colloidal tests in the cerebrospinal fluid. (5) There is a change of color (yellowish-brown discoloration) and odor of the cerebrospinal fluid. (6) There seems to be no correlation between the destruction of the Wassermann bodies and that of the albumins in the cerebrospinal fluid.—*Am. Jour. Dis. Child.*, (August), 1931.

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**Treatment of Psoriasis: Continued Observations on the Use of Crude Coal Tar and Ultraviolet Light. William H. Goeckerman.**

*Arch. Derm. and Syph.*, **24**:446, (September), 1931.

The use of tar and ultraviolet light in the treatment of psoriasis is the outgrowth of a persistent effort, not to "cure," but more effectively to control individual attacks. There is no evidence that this treatment will in any way fundamentally modify the course of the disease. Intervals of freedom from eruption are probably not determined by it. Psoriasis associated with arthritis responds symptomatically as well as psoriasis without arthritis. For some unknown reason, the arthritis is materially benefited in about half the cases by treating the lesions of the skin. A small percentage of cases with rather distinctive clinical manifestations does not respond well to the treatment. Its beneficial effect in exfoliative dermatitis secondary to psoriasis is unique. It is not recommended as a measure to be applied as a routine for a few patches of psoriasis as other efficacious methods are more simple, but it can often be used without materially interfering with the patient's work. The scalp and nails do not lend themselves to this method of treatment. It is a decidedly valuable method for clearing up temporarily extensive and resistant eruptions on the glabrous skin, and practically always succeeds when various forms of treatment by roentgen rays, chrysarobin or other substances and methods have failed or are contraindicated. The principles of the treatment must be applied and the simple technic mastered, or success cannot be expected.—*Author's Conclusions.*

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**Critical Review: The Harmful Effects of Irradiation (Roentgen Rays and Radium). Humphry Rolleston.**

*Quart. J. Med.*, **23**:101, (October), 1930.

Rolleston discusses the subject of the harmful effects of irradiation under the following headings: "Introduction, The Stimulating Effect of Irradiation on Normal Tissue, The Stimulating Effect of Irradiation on Malignant New Growths, Injury of the Foetus by Maternal Irradiation, Acute Constitutional Symptoms; Chronic Constitutional Changes: (*a*) In the Blood and Blood-Forming Organs; (*b*) The Question of Irradiation-Induced Leukemia; (*c*) Aplastic Anemia; (*d*) Radium Poisoning; Local chronic Lesions: (*a*) Chronic X-Ray Dermatitis; (*d*) X-Ray and Radium Malignant Disease, and (*c*) Permanent Changes in the Viscera."

An excellent list of 288 references accompanies the review.

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**Influence of Ultraviolet Rays on the Hatching of Chickens. Cholevcuk.**

*Compt. rend. Soc. de biol.*, **100**:586, (March 1), 1929.

The irradiation of hen's eggs in an incubator caused an increase of 17.7 per cent in the number that hatched. The effect was greatest when the eggs were submitted to the light for fifteen minutes each day. The vitality of the chicks hatched from irradiated eggs was much greater than that of the controls. No marked increase in the weight resulted.

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**Action of Ultraviolet Light on Human Blood. K. A. Vannefalt.**

*Compt. rend. Soc. de biol.*, **101**:610, (June 21), 1929.

In some cases a thrombocytosis was observed in man after one exposure. In serial applications a preliminary thrombocytosis was observed in man after one exposure. In serial applications a preliminary thrombopenia, followed by thrombocytosis, was evident. No change was apparent in the number of polymorphonuclears and mononuclears.

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**Roentgen Treatment of Hypertrophied Tonsils. L. Klotz.**

*München. med. Wchnschr.*, **77**:1756, (October 10, 1930.

The treatment for hypertrophied tonsils by exposure to roentgen rays passing through the skin may result in areas of erythema and pigmentation. To avoid this possibility, Klotz applies the roentgen rays through the mouth. In this way a smaller field

is irradiated and there is less danger of injury to other tissues. The technic is described in detail. Two treatments are given, two or three days apart. Forty patients, five of whom were between 6 and 12 years of age, were satisfactorily treated. A few patients had dryness of the mouth for one or two days. There were no other undesirable effects. In half of the cases the tonsils shrank to normal size in two and a half months. Only when roentgen treatment fails should surgical removal be considered.

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**Physical Therapy Measures in Selected Cases of Sinusitis. Louis Feldman.**

*Brit. Jour. Actino.*, **5**:184, (December), 1930.

The technic of treatment and the results obtained in 200 cases of sinusitis are reported. There were 100 acute, 71 subacute and 25 chronic cases. Some of them were observed for three years. The treatment consisted of the application of nasal pledgets of 4 per cent solutions of cocaine and epinephrine for five minutes. This was followed by the application of the indirect high frequency monopolar current from the Telsa or Oudin terminals of a high frequency generator. This was applied for about ten minutes over the sinuses and produced an active hyperemia. In many cases the patient felt a marked improvement as was evidenced by relief from headache and pain and by a more or less mucopurulent discharge. This was followed by the intranasal, intra-oral and pharyngeal application of ultraviolet rays by means of special quartz applicators attached to a water-cooled quartz mercury generator. The treatment was repeated at intervals of from three to five days.

The chronic cases showed only a slight or temporary relief from the treatment, and many patients had recurrences. In the subacute group, thirty-five patients had definite relief for periods of from two weeks to two years. Nearly all of the acute cases showed relief or cure.

In conclusion the author states that the results warrant further research on this and similar physical measures.

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**The Relationship of Type of Radiant Energy to Its Activation of Vitamins in Yeast. L. H. Jorstead.**

*Jour. Lab. and Clin. Med.*, (1931), **16**:1169 (September).

The Cooper-Hewitt lamp, quartz light, and low-voltage x-ray cause an activation of vitamin D and vitamin A in brewer's yeast fed to rats along with a dietary deficient in these vitamins. The necessary period of exposure to the light in each case varies with the type of light used. A maximum point of activation is found with each ray. These findings tend to refute the idea that certain lights are specific in the liberation of certain products, such as vitamin A, by the quartz light, etc. These experiments tend to establish that vitamin D is closely allied with vitamin A and that the liberation of these vitamins from brewer's yeast depends upon the amount of "ray" energy given.—*I. C.*

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**Action of Light on Bacteria. O. Winterstein.**

*Strahlentherapie*, **39**:619, (February 21), 1931.

Winterstein's tests have confirmed the observation that ultraviolet rays are able to impair the growth of pathogenic and nonpathogenic bacteria or to destroy them. Young cultures proved to be more sensitive to the rays than old cultures. The resistance differed in bacterial individuums of the same culture and in various strains of homogenous bacteria; moreover the resistance appeared to be different in various bacterial species. The growth of fresh and of six hours old cultures was impaired by a dose of rays below or about that causing erythema in the abdominal skin. A dose of about or above that causing erythema was fatal for fresh cultures, while a dose causing severe burns was necessary for destruction of cultures six hours old. A dose of rays causing erythema of the abdominal skin proved fatal for streptococci; a much larger dose, namely, such as causes injury of the tissues, was necessary for destruction of *Staphylococcus aureus* and *Bacillus coli*. The resistance of tubercle bacilli proved to be twice as great as that of staphylococci. No connection was found between the resistance of bacteria to acids and that to light. It appeared that the visible and the ultraviolet rays have no amitokinetic action. Bacteriophages displayed a notable sensitiveness to the rays. Ferments appeared to resist the rays better than did bacteriophage. A clinical dose of ultraviolet rays was able to destroy a large number of bacteria, chiefly of nonpathogenic bacteria, suspended in the air or present on the ground and on the surface of objects. In the air experimentally infected with colon bacilli, streptococci and staphylococci, the microbes remained for hours when the weather was dry, while damp weather appeared to favor their settling on the ground. Bacteria proved to survive in dried and pulverized garden earth exposed to ultraviolet rays. The rays were able to destroy a large number of bacteria present on the human skin; the necessary dose was well tolerated by the hands and forearms but caused burns on the abdominal skin. The clinical dose of rays was unable to destroy bacteria in wounds, nor could the rays destroy pneumococci and streptococci present in pus. Rays cannot be used for sterilization of suture threads, because their action is superficial; they do not destroy bacteria present within the threads. Evidently the visible, and especially the ultraviolet rays, appear to cause changes in the protein structure of the bacterial protoplasm resulting in impairment of growth and destruction of bacteria. Large doses of rays were able to destroy antibodies. Sensitization to light, namely, to visible rays, appeared possible by means of fluorescigenous dyes. The author emphasizes that the therapeutic value of artificial ultraviolet rays ought not to be overestimated.—*Arch. Derm. and Syph.* (August), 1931.

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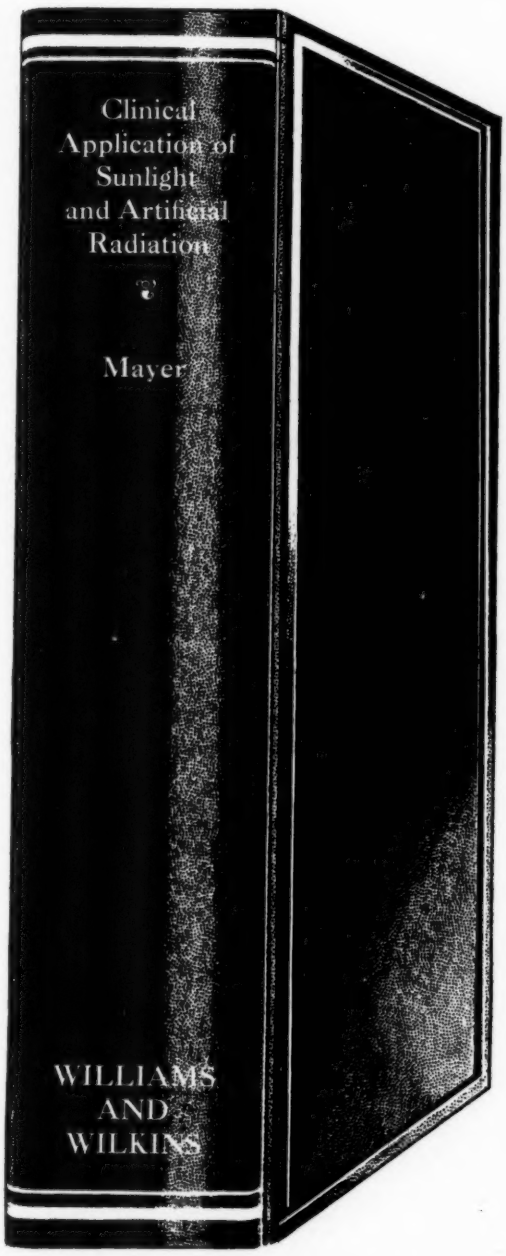


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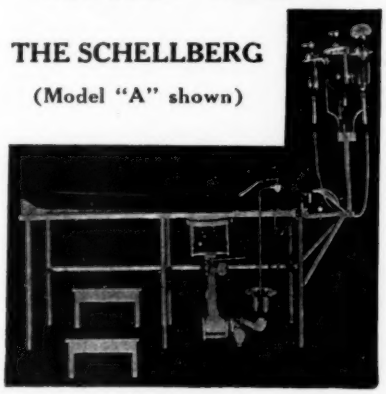

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